THE FUTURE OF TRANSPORT

EV adoption and smart charging for electric vans and commercial fleets

Main Findings Report

Completed by TRL Ltd for the Department for Energy Security and Net Zero prior to the recent general election in the United Kingdom in July 2024. As such, any references to government policies, commitments, or initiatives may reflect the stance of the previous administration and were accurate at the time of fieldwork and writing.

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Executive Summary

Background

The Government is committed to decarbonising transport by phasing out the sale of new petrol and diesel cars and vans, and by 2035[1], all new cars and vans must be zero emissions at the tailpipe. The passenger car market has seen an increase in consumers purchasing electric alternatives, but the market take-up of electric vans is currently less developed compared to passenger cars. Whilst the push for more electric vans is important to meet net zero targets, more electric vehicles will mean an increased demand on the UK's electricity capacity. Smart charging can counteract this to some degree.

There is currently little evidence on the driving and charging patterns of van fleets, and the barriers to uptake of electric vans and smart charging technology. This research explored:

- The driving and charging patterns of commercial van fleets.
- Enablers and barriers that commercial fleet operators and drivers face in adopting electric vans.
- Enablers and barriers that commercial van fleet operators and drivers face in installing and using smart charging technologies.

This research included a survey with van fleet operators (n=53), interviews with 23 van fleet operators and interviews with 44 van drivers. Participants worked for businesses in a variety of sectors and locations. The fleets ranged in size from two to 55,203. The sample was weighted towards those who operated or drove electric vans but, as a point of comparison, also included those who did not. The sample was not intended to be representative of the entire population of van drivers and operators, and therefore findings may not apply to all drivers or operators.

Key findings

Charging patterns of commercial van fleets

Most electric van charging was reported to be done overnight (i.e., hours between 2000 and 0700 the following day). Fewer operators reported charging between 0700 and 1600.

At night, the majority of participants charged their electric vans at the depot or using private or on-street residential chargers.

[1] Following the general election in the United Kingdom in July 2024, the commitment to phase out the sale of new cars that rely solely on internal combustion engines has been amended to 2030.

During the day, enroute charge points were reported to be the main charging sites, followed by the depot. Charging in the daytime was mostly reported as a less desirable option, suggesting that it was not typical to be charging during the day.

Enablers and barriers commercial fleet operators and drivers face in adopting electric vans

Operators, included in this research, who had adopted electric vans tended to run businesses which required shorter drive distance per shift and/or where drive distances were more consistent. It appeared that those who drove more varying distances between shifts were less likely to have adopted electric vans, due to concerns around range.

It was notable that operators, included in this research, who had adopted electric vans tended to have done so for only part of their fleet. This seemed to be because they had different types of operations within the business, and electric vans were deemed suitable for those driving the shorter and/or less variable routes – but not for other routes.

Overall, operators and drivers who participated in this research seemed supportive of electric vans in theory and were mostly aware of government targets to phase out Internal Combustion Engine (ICE) vehicles.

However, several barriers existed. Key barriers reported by the research participants were:

- **In some use cases, the current models of electric van don't provide the ability to travel the daily distances required without being re-charged during the working shift**, which operators were reluctant to do. Some research participants were unsure whether the advertised range of vans was accurate for their payloads.
- **Research participants felt that there isn't currently a cost-effective and feasible way to charge electric vehicles.** Many don't use a back-to-depot model which means that they would be reliant on public charging. Some felt that public charging is expensive and would negate any cost savings achieved by the overall lower cost of electricity, compared to petrol or diesel. Other challenges included a perception that charge points for business vehicles are hard to find, may not be in working order, may not be suitable for large vans and may require waiting for long periods of time.
- **Home-charging by drivers was not always possible or practical.** Many drivers reported that installing a charge point at their home would not be feasible, and operators were worried about some of the practicalities around ownership of and responsibility for charge points, along with reimbursement processes.
- **Those who did operate a back-to-depot model cited the cost of installing charging infrastructure at depots as a barrier.** Operators cited the cost of large upgrades to site power supplies to be a barrier despite some awareness of the Workplace Charging Scheme and Electric Vehicle (EV) Infrastructure grants.
- **Participants reported that adopting electric vans seemed complex and daunting.** Some indicated that they were unsure where to begin and who to trust for advice. Some

felt that they were having to navigate this new area alone, with little joined-up approach across businesses and regions.

To overcome these barriers industry, Government and Local Authorities should consider the following recommendations:

- Support vehicle manufacturers to improve vehicle range technology, for example by continuing the Faraday Battery Challenge funding and introducing the Zero Emission Vehicle mandate to stimulate investment.
- Continue to mandate the use of shared, real-time charge point data to provide functional charge point availability updates and encourage charge point operators to go further by sharing wait times and space size.
- Consider expanding existing grants (e.g., Electric Vehicle Infrastructure grant) or creating new ones to cover the upgrading of power supply to business sites (e.g., new substations), as well as raising awareness of these grants.
- Commission work to validate and develop potential business models around shared private charging facilities, which could inform the development of a blueprint for this type of facility.
- Help guide operators and fill knowledge gaps on adopting electric vans (e.g., around infrastructure upgrades / home-charging approach).
- Consider reserving some public charge points for commercial vehicles only (no private vehicles) as is the case with kerbside bays which are reserved for commercial vehicles loading/unloading only.
- Create a knowledge-sharing community – potentially facilitated by trade associations – to encourage operators who have upgraded infrastructure to share their experiences and learnings.
- Explore the merits of an updated Worldwide Harmonised Light Vehicle Test Procedure for commercial vehicles to improve the validity of range data. Original equipment manufacturers could benefit from market advantages by carrying out testing with different payloads and releasing the resulting data to operators.
- Original equipment manufacturers and trade associations should work together to make demonstrator vehicles more readily available across business (customer) sizes.

This report also contains detail about several other barriers identified as well as appropriate recommendations to address them.

Enablers and barriers commercial fleet operators and drivers face in adopting smart charging technologies.

Sixteen operators surveyed, five operators interviewed, and four drivers interviewed reported that they were using smart charging approaches. We did not identify any specific characteristics which influenced whether an organisation was using smart charging or not.

Key barriers to adopting smart charging for the whole sample were:

- **Poor awareness** of smart charging and poor understanding of the different approaches by both operators and drivers.
- **A lack of awareness of the benefits of smart charging to their specific organisation.** Drivers who were consulted struggled to see how smart charging would benefit them individually.
- **Concern that smart charging approaches would require significant effort to set up and operate on a day-to-day basis**. This was partially driven by lack of familiarity around the technology. Operators who were consulted felt that the effort outweighed the potential cost-savings that could be realised.
- **A lack of consideration of smart charging because participants were focusing on adoption of electric vans as a first step.** Some of the operators who were consulted were struggling to adopt electric vans in the first place and so smart charging was a detail that was far from their minds.

Key recommendations to overcome these barriers are:

- Raise awareness among businesses of the existence, variety and benefits of smart charging approaches, potentially in an integrated fashion with existing information about electric vehicle adoption. This could include working with trade associations, energy suppliers and manufacturers to distribute information.
- Provide guidance or financial support – especially for smaller fleets – for installing or upgrading to systems such as V2X or additional software to manage tariffs.

1 Background

As part of the UK's Net Zero 2050 Strategy, in November 2020, the UK government announced that by 2030 the sale of new internal combustion (i.e., petrol and diesel) cars and vans would be phased out (GOV.UK, 2021b). However, the Government confirmed last year that all new cars and vans must be fully zero emission from 2035[2]. Due to this, there is likely to be a reduction in the number of Internal Combustion Engine (ICE) vehicles on UK roads, with them being replaced in part by electric vehicles (EVs). Therefore, the demand for electric vehicles is expected to grow in response to this policy.

In particular, and compared to passenger cars, the market take-up of electric vans is currently less developed. Government statistics show that roughly four times more new cars (21.4%) than new vans (5.1%) sold in the first quarter of 2023 were plug-in electric (GOV.UK, 2022). There are also complications because vans typically operate in commercial fleets, and that van drivers can be divided into many different categories, or archetypes, each with different driving and refuelling habits.

Whilst the push for more electric vans is important so that newer vehicles can be on the road post 2030, more electric vehicles will mean an increased demand on the UK's electricity capacity. This increased demand may become an issue when van drivers who work 9am-5pm charge up their vehicles at the end of their shift. This could therefore cause an additional strain due to the spike in the electricity needed by the National Grid.

Smart charging (shifting charging to a different time of day to ensure a lower demand on the grid (GOV.UK, 2021a)) can counteract this to some degree. It also offers benefits both to the user (in terms of cost savings) and to the electricity system (in terms of capacity needed on the system). Whilst challenges exist with smart charging, including 'secondary peaks' overnight and higher electricity requirements in the winter, smart charging may offer advantages such as cost savings to fleet operators.

Despite this opportunity, there is currently little evidence on the current driving and charging patterns of van fleets.

The objectives for the research therefore are to understand:

- The driving and charging patterns of commercial van fleets.
- Enablers and barriers commercial van fleet operators and drivers face in installing and using smart charging technologies.
- Enablers and barriers commercial fleet operators and drivers face in adopting electric vans in the first place.

[2] Following the general election in the United Kingdom in July 2024, the commitment to phase out the sale of new cars that rely solely on internal combustion engines has been amended to 2030.

The outputs of this research will inform the consideration and development of potential policies to support the uptake of commercial EVs and charging infrastructure and assist with the Government's plan to achieve net zero.

2 Methodology

The present study gathered the evidence via extensive engagement with fleet operators and van drivers, giving DESNZ a comprehensive data set to aid future planning. This included a quantitative survey with commercial fleet operators, interviews with fleet owners and interviews with commercial electric van drivers (all research methods involved recruiting both EV and non-EV participants).

Recruitment

We reached out to trade bodies to request that they share the link to the survey and the expression of interest (in an interview) form with their fleet operators. We also reached out to fleet operators that we had previously sought out for research purposes. We recruited van drivers through two recruitment agencies as well as via the fleet operators.

Methods

Survey with commercial van fleet operators

A survey was devised for fleet operators with both electric vans in their fleet, and fleet operators with no electric vans in their fleet. In full, 53 fleet operators completed at least part of the online survey, with 33 completing the full survey. All participants completed a consent form at the beginning of the survey.

Semi-structured interviews

We interviewed 23 fleet operators and 44 drivers regarding their van (drivers) or van fleet (fleet operators), experience of electrification and smart charging. These were conducted either via phone, or on Microsoft Teams with a researcher who recorded the discussion. All participants completed a consent form (either physically or verbally).

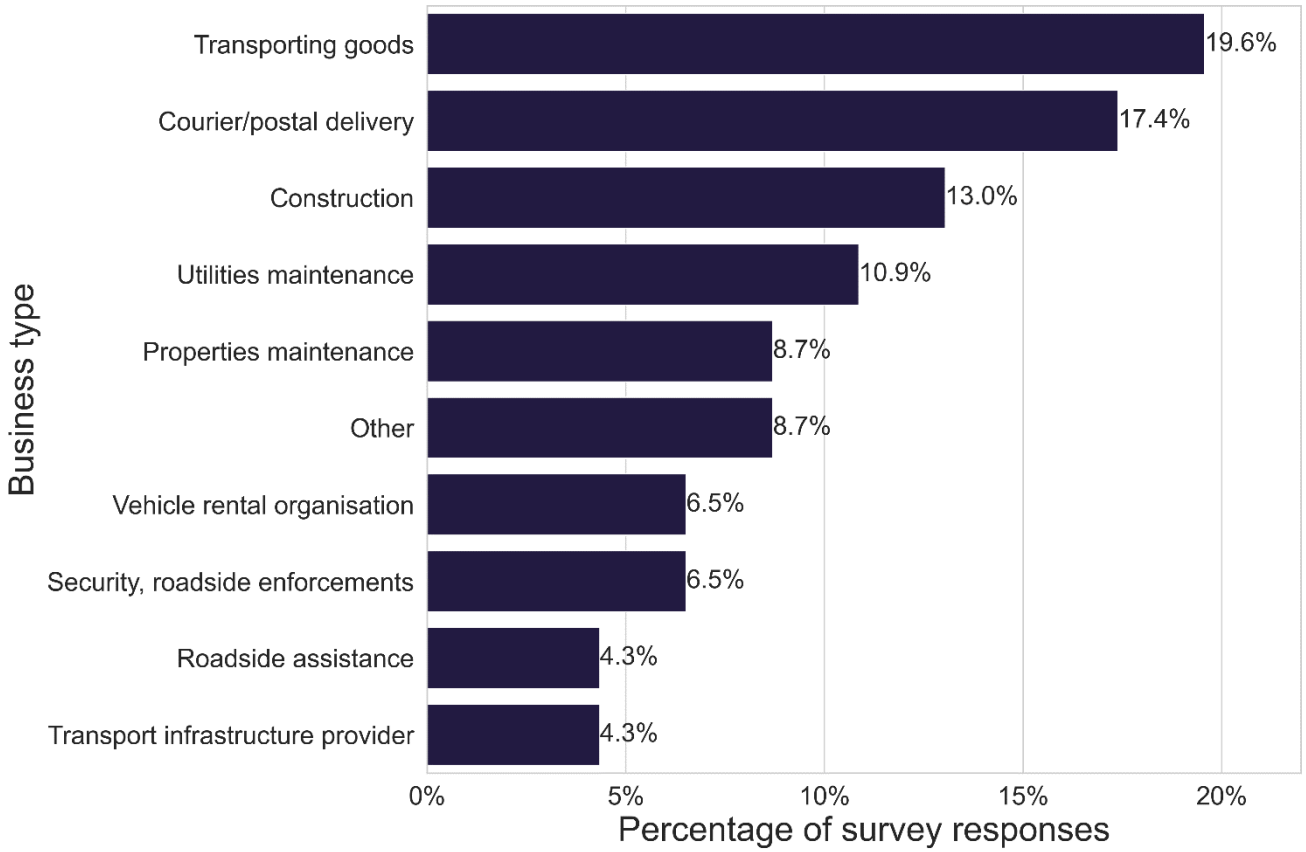
Sample

Survey

We gathered a total of 33 complete responses and 20 incomplete responses. Of the 33 responses 18 (55%) had electric vans in their fleet, while 14 (42%) had some or no electric vehicles. One participant was removed from analysis as they only had one vehicle in their fleet that was an electric pool car. Of the incomplete responses, participants stopped at different parts of the survey, therefore, their responses were taken for only some of the questions where it was deemed that the question was answered in full. For this reason, each summary point in this report will have a different *n* value, and they will not all add up to 53 responses.

It should be noted that this is a small sample size, and that this limits the conclusions and generalisations that can be made. Moreover, this sample is not representative of the fleet population, which should also be borne in mind when considering the findings. More detail about the profile of individual survey respondents can be found in Appendix A List of fleet operators and van drivers interviewed and surveyed.

Figure 1: Distribution of business activities reported by operators (N=46)



Operators conducted various business activities, with the majority (37%) transporting goods or providing postal/courier services (Figure 1). The category ‘transporting goods’ includes activities such a home or supermarket deliveries for food, B2B deliveries, delivery of medical goods, and other broader accounts of delivering various items. ‘The courier/postal delivery category’ includes door-to-door delivery services of packages or mail. The ‘other’ category includes responses where operators have indicated multiple primary business activity such as ‘delivers, breakdown responses, mobile service vans’. It also includes a business that did not fit in any of the other categories such as ‘dog day care’.

Only 14 (30%) respondents had one main base in the UK and 34 of them (74%) had more than one base throughout the UK. Only five participants stated they were answering the survey at the branch level.

Figure 2 shows the geographic distribution of the data provided by operators. Note that participants could select multiple site locations.

Figure 2: Geographic distribution of operators from survey (N=46)

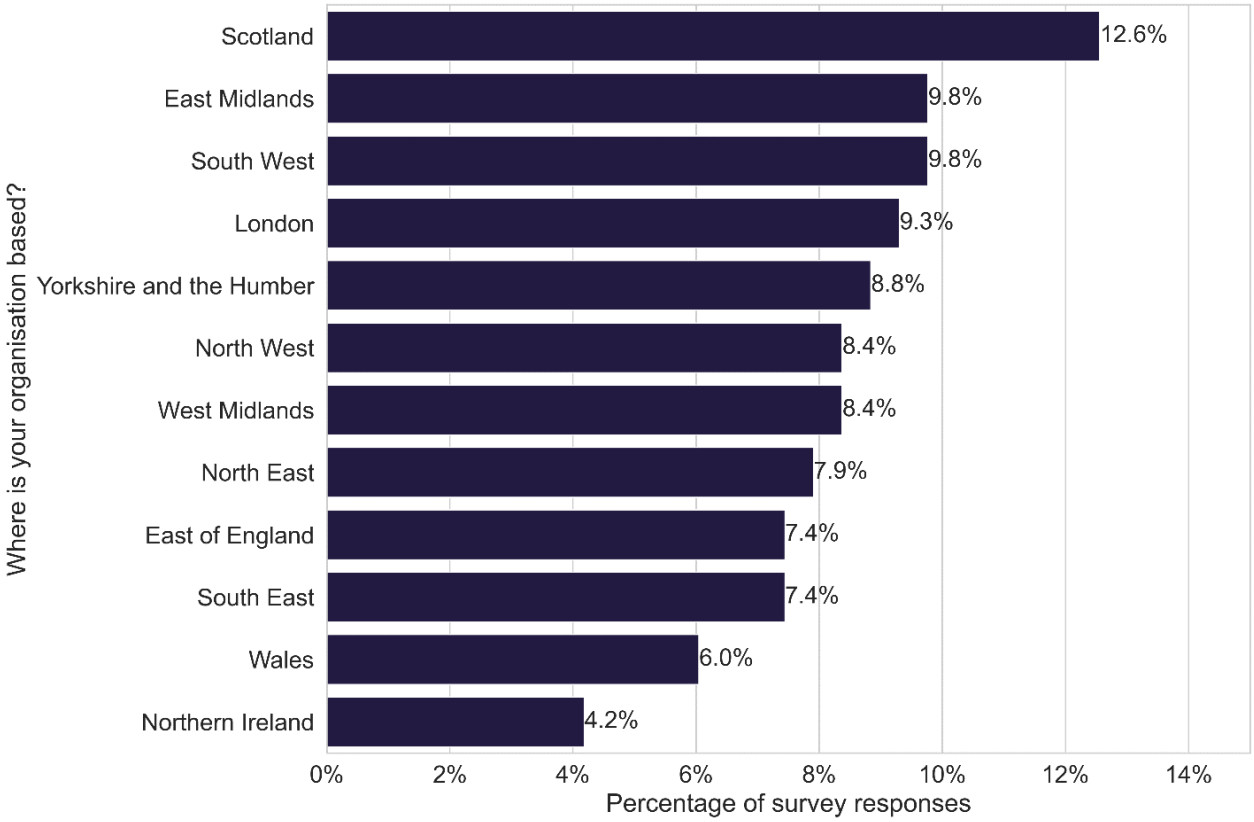
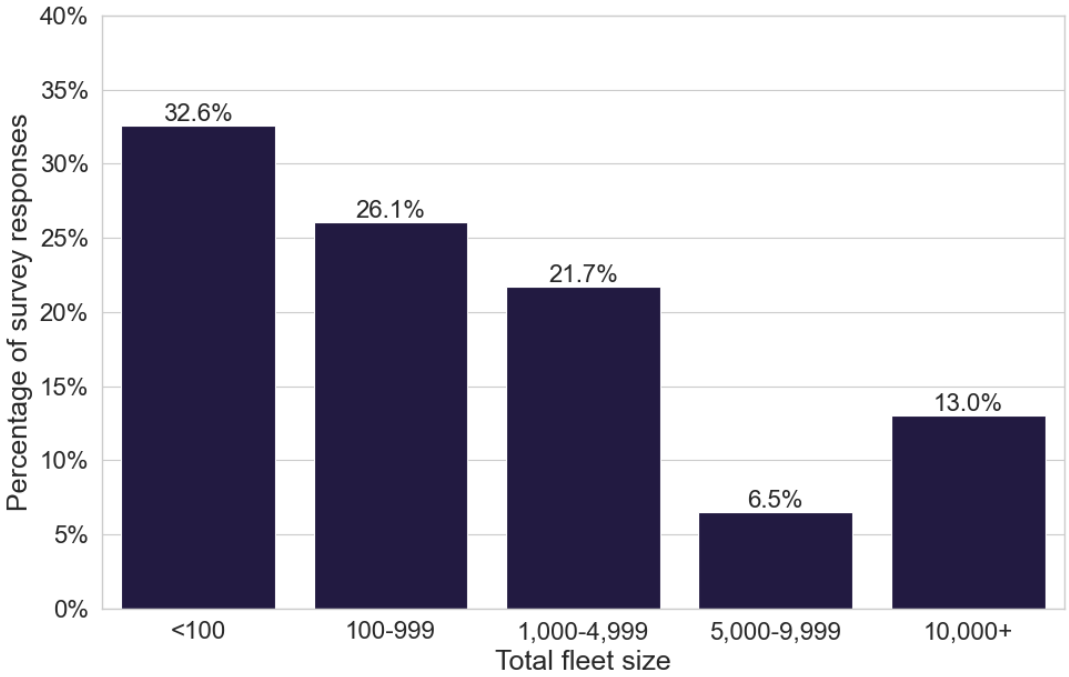


Figure 3: Distribution of total fleet size of operator survey (N=46)



We received survey responses from fleets of varying sizes ranging from three vehicles to 55,203 vehicles in the fleet. Fifteen respondents (32.6%) had fewer than 100 vehicles, 12 (26.1%) had 100-999 vehicles, 10 (21.7%) had 1,000 – 4,999 vehicles, three (6.5%) had 5,000 – 9,999 vehicles and six (13%) had more than 10,000 vehicles (Figure 3).

Figure 4: Distribution of typical weekly milage of vans reported in operator survey (N=41)

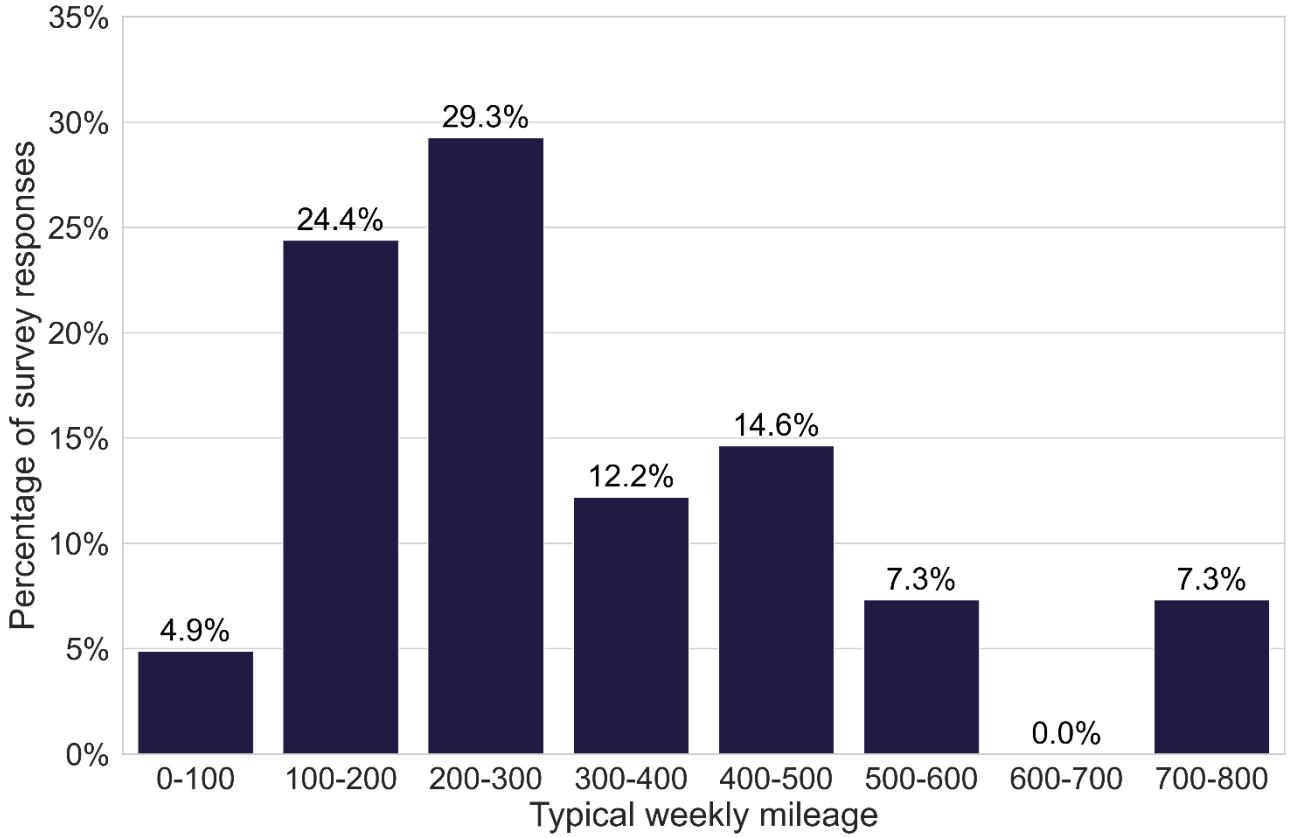


Figure 4 shows the distribution of a typical weekly mileage of all vans in the fleet reported. The majority (53.7%) of the typical weekly mileage reported were within the 100-300 miles range. Participants were asked how often their vans travelled on rural roads with the majority (60%) saying their vans 'often' travelled on rural roads while there were five responses for 'always' (12%), nine for 'sometimes' (21%), and three for 'rarely' (7%).

Interviews

Given the variety of use cases for commercial vans in the UK, the initial sample specification for fleet operators and van drivers consisted of several variables. This aimed to get the best representation of different viewpoints as possible. It should be made clear that this sample is not intended to be proportionally representative of the entire population of van drivers or operators, and that findings may not apply to all drivers or operators. It should also be noted that the characteristics of the entire population of van drivers and operators is unknown, and therefore it is challenging to say with confidence which groups were over- or under-represented in this research.

Despite some initial challenges with recruitment of drivers, the final sample of 23 operators and 44 drivers achieved a good mix of different desirable attributes. More detail about the profile of individual interview participants can be found in Appendix A List of fleet operators and van drivers interviewed and surveyed.

Within the interview sample:

- Fleet size varied, from fleets of less than five to fleets of over 200.
    - Fleets of 200+ was the most common size among van operators and drivers, with 23 participants falling into this category. Fleet sizes of 2-9, 10-50, and 51-200 had fifteen, fourteen, and fourteen participants respectively. There were more operators than drivers in the 200+ category, while there were more drivers than operators in the other three categories.
- Business sectors included a range of activities, such as security patrols, above and beyond the more common couriers and maintenance provider industries.
    - The most common business activities were either courier/postal delivery or transporting goods, which made up 27 of the 67 in the sample (containing twelve and fifteen participants respectively). The next best represented activity was properties maintenance, with fourteen participants. Activities with fewer than five participants represented included roadside assistance, transport infrastructure provider, and security and roadside enforcement.
- The representation of vans operating in different regions of England was fairly well balanced across the North, South, and the Midlands. Wales and Scotland were represented in the sample, but in far fewer numbers.

The sample was weighted towards those who operated or drove electric vans but, as a point of comparison, also included those who did not:

- Drivers: 31 drove electric vans, 13 did not.
- Operator interviews: 15 had electric vans, eight did not.

For the electric van operators / drivers, the most important variable influencing recruitment was a participant's archetype. Previous research from Element Energy (2022) categorised van usage into 12 archetypical groups made up of a combination of three factors:

- Operating type (distance driven from base location).
- Overnight charging location preference (depot or residential).
- Daytime charging location preference (public or private infrastructure).

Table 1: Number of participants in each archetype

Archetype	Operating area	Overnight charging location	Daytime charging location	Sample total
1	Within 15 miles of their base	Residential	Public	0
2	Within 15 miles of their base	Residential	Private	1
3	Within 15 miles of their base	Depot	Public	4
4	Within 15 miles of their base	Depot	Private	6
5	Between 15 and 50 miles of their base	Residential	Public	5
6	Between 15 and 50 miles of their base	Residential	Private	4
7	Between 15 and 50 miles of their base	Depot	Public	6
8	Between 15 and 50 miles of their base	Depot	Private	6
9	Over 50 miles from their base	Residential	Public	0
10	Over 50 miles from their base	Residential	Private	1
11	Over 50 miles from their base	Depot	Public	9
12	Over 50 miles from their base	Depot	Private	4

Table 1 outlines how many participants fell into each archetype. All but two archetypes (types 1 and 9) were represented in the sample. It is suggested in the Element Energy research that these archetypes might predominantly consist of single van users, which were excluded from the study unless they were contracted to work for a fleet. Table 1 shows that driving between 15-50 miles from the base location was the most common operating area for electric vehicles, with 21 participants falling into this group. Meanwhile, the other two groups were slightly less

well represented, with eleven participants operating in an area less than fifteen miles from their base and fourteen operating in an area over 50 miles from their base.

For non-electric van operators / drivers, operating area *only* was taken to be the most important variable influencing recruitment. As with their electric-driving counterparts, participants operated / drove:

- < 15 miles from their base per day
- Between 15 and 50 miles from their base per day
- > 50 miles from their base per day

Table 2 outlines how many participants fell into each category. Here it can be seen that, in contrast to the participants who drove electric vans, operating over 50 miles from their base was the most common operating area for non-electric van drivers and operators.

Table 2: Number of participants operating non-electric vans in each operating area category.

Operating area	Sample total
Within 15 miles of their base	2
Between 15 and 50 miles of their base	7
Over 50 miles from their base	12

A more detailed overview of the characteristics of individual respondents from the sample is described in Reflections on archetypes and Appendix A List of fleet operators and van drivers interviewed.

Analytical framework

Interview data were analysed using Thematic Content Analysis to identify common themes and important insights. We used an analysis grid – a Microsoft Excel document which notes key details from each interview against specific headings (e.g., current approach to charging, motivations for using smart charging, barriers for electrifying fleet, etc.) – to make it easier to compare experiences and group them into themes. Themes were explored further by seeking to identify similarities and differences across user groups. Findings were also compared with data from external studies to identify whether they were consistent or not.

Following this, we used the COM-B model of behaviour change to systematically categorise the barriers and enablers and identify which of these categories were most frequently reported by participants (Figure 5). COM-B is a simple but effective model which is frequently used to identify barriers preventing behaviour change. It groups barriers into three categories:

- Capability: A person's psychological and physical ability to engage in a behaviour
- Opportunity: External factors that enable a behaviour
- Motivation: A person's willingness to engage in a behaviour

It assumes that all three factors must be present in order for a behaviour, such as EV adoption, to take place.

From this, we used the Behaviour Change Wheel (Michie et al., 2011) to help identify relevant policy ideas to increase uptake of EVs and smart charging.

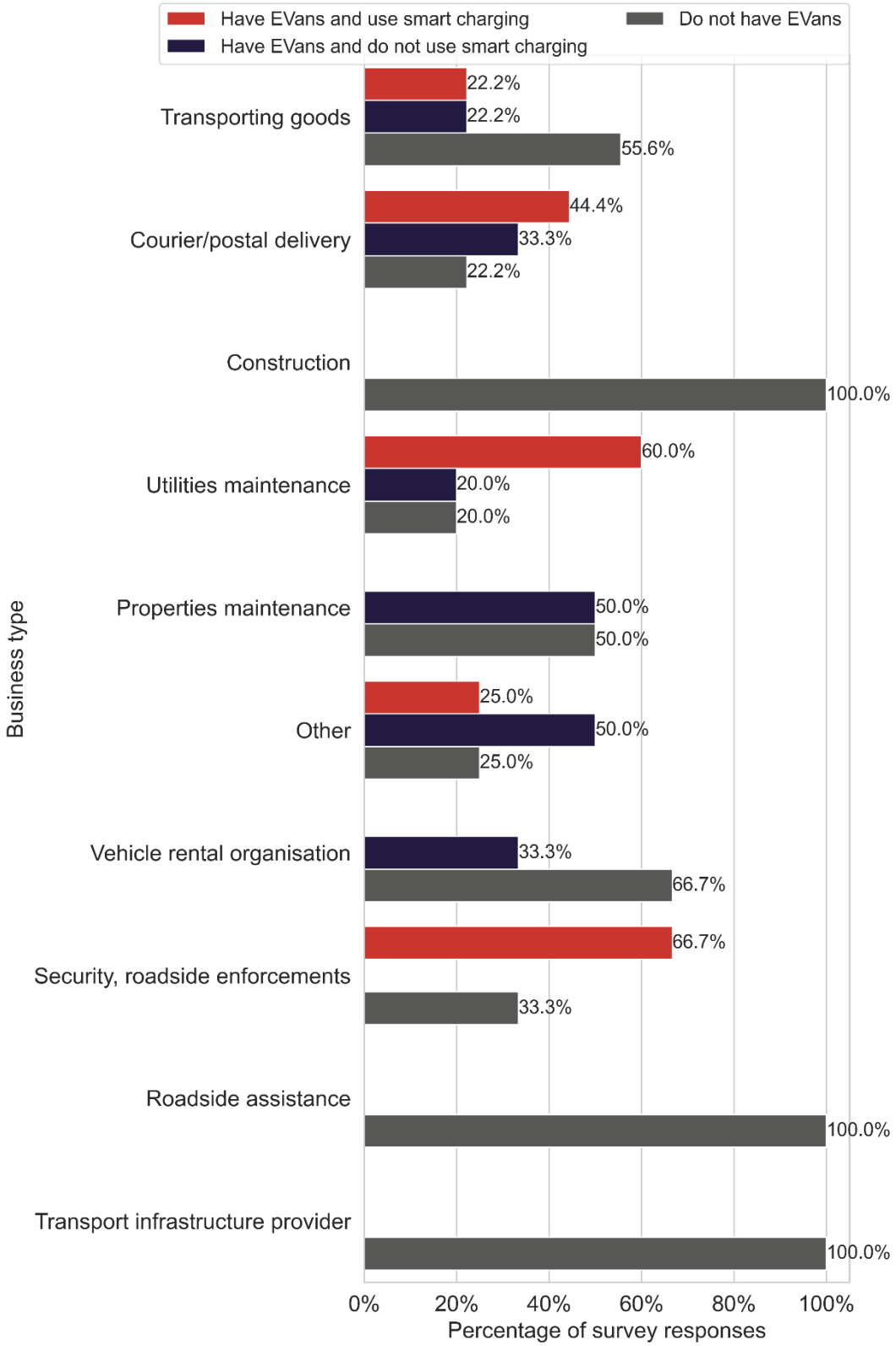
Figure 5: The COM-B model

3 Which types of fleet operators and drivers had adopted electric vans?

This section sets out the characteristics of the fleet operators and drivers from this study who had adopted electric vans. Findings are based mainly on responses to the operator survey, supplemented by findings from interviews with drivers and operators from this project. It should be emphasised that the low response rate of the survey means the findings outlined here are specific to this research only, and thus trends may not be reflective of the whole industry. Moreover, the intention of qualitative research is to establish lived experiences, rather than generalisable findings to particular groups.

In our sample there were not many clear patterns in terms of who had adopted electric vehicles. Organisations which have adopted electric vans varied in terms of business activity, typical van milage undertaken, and typical distance driven from base. This may be influenced by the fact that we deliberately sampled to include a range of types of organisations.

Figure 6: Adoption of electric vans by business activity (N=45)

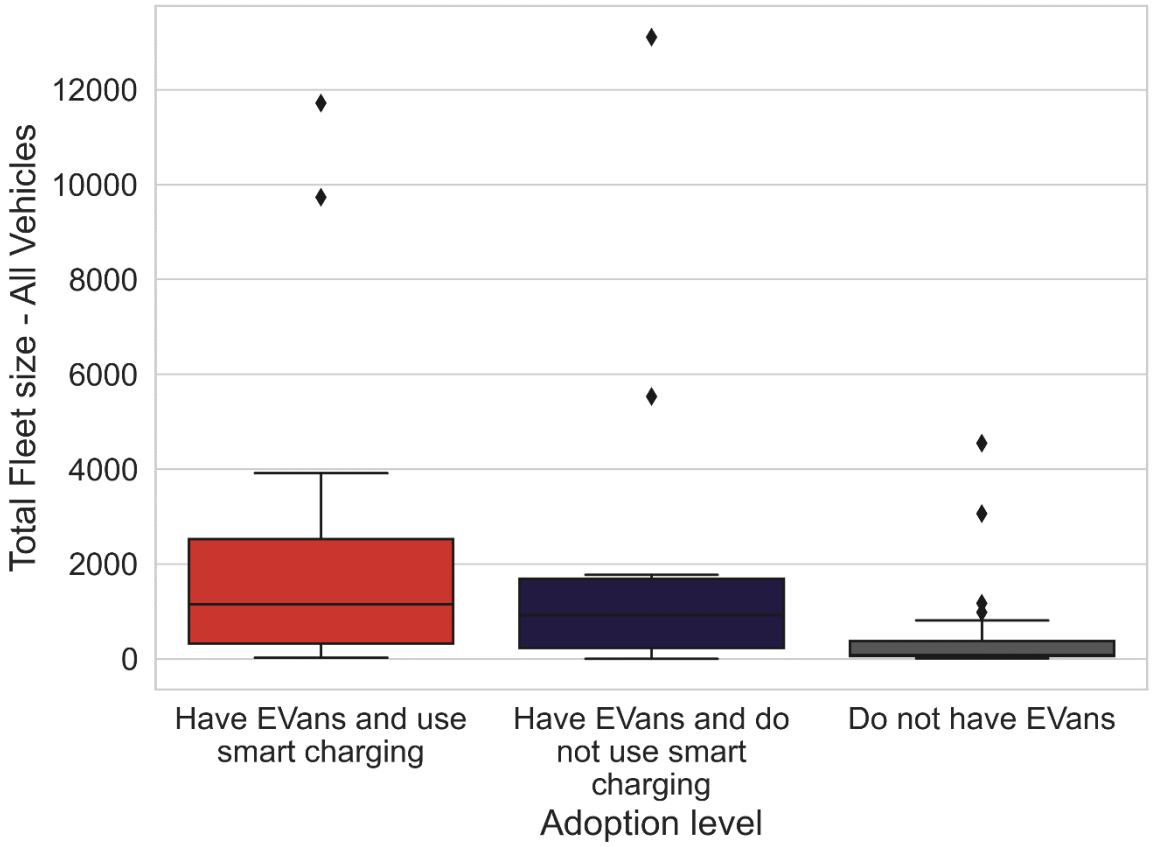


Business activities had little influence on operators and drivers who had adopted electric vehicles

Figure 6 shows the distribution of business activity by level of adoption of electric vans and smart charging technology. This data comes from operators who responded to the survey. There was no clear pattern observed in business activity and adoption of electric vans.

The drivers we interviewed also worked in various industries of different fleet sizes, with the majority working in postal/courier services and property maintenance. The lack of patterns around business activity is likely to be influenced by the fact that we deliberately sampled to include a range of types of drivers.

Figure 7: Adoption of electric van by overall fleet size



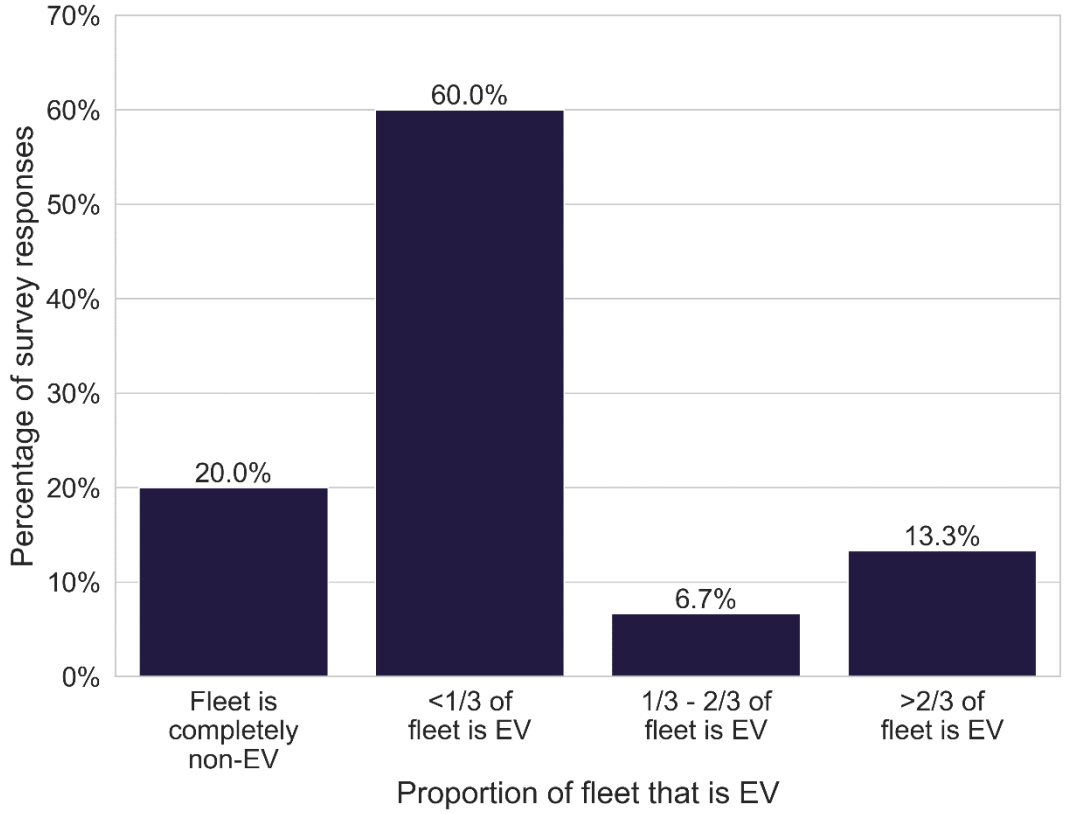
Fleets of all sizes were adopting electric vehicles

Figure 7 shows the adoption of electric van by overall fleet size. For the purposes of this figure only, we removed responses from fleets bigger than 19,001 vehicles to present the above chart as they positively skewed the results. The survey data shows that fleets of various sizes are willing to adopt electric vans. From those who responded to the survey, it seemed as though those who hadn't adopted electric vans were the smaller fleets. Of those operators with small fleets who were interviewed, some indicated that the initial cost of purchasing the electric vans was too high to consider the potential savings that would be made on overall operational

costs (detailed on page 28). Additionally, some stated they were struggling to access vehicles (further explored on page 33). In contrast, the majority of electric van drivers who were interviewed tended to be part of small fleets (i.e., fleet size between 2-9 vehicles).

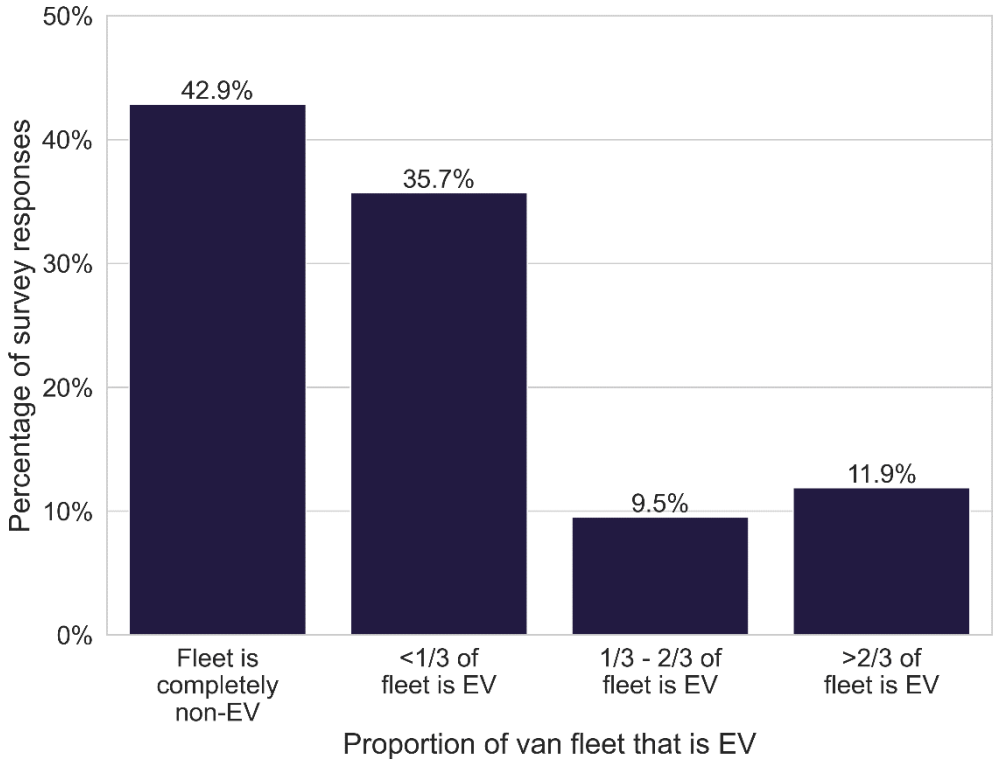
These results echo findings from the interviews that indicated operators of all types of fleet sizes were motivated to adopt electric vans.

Figure 8: Proportion of total fleet that is electric (N=45)



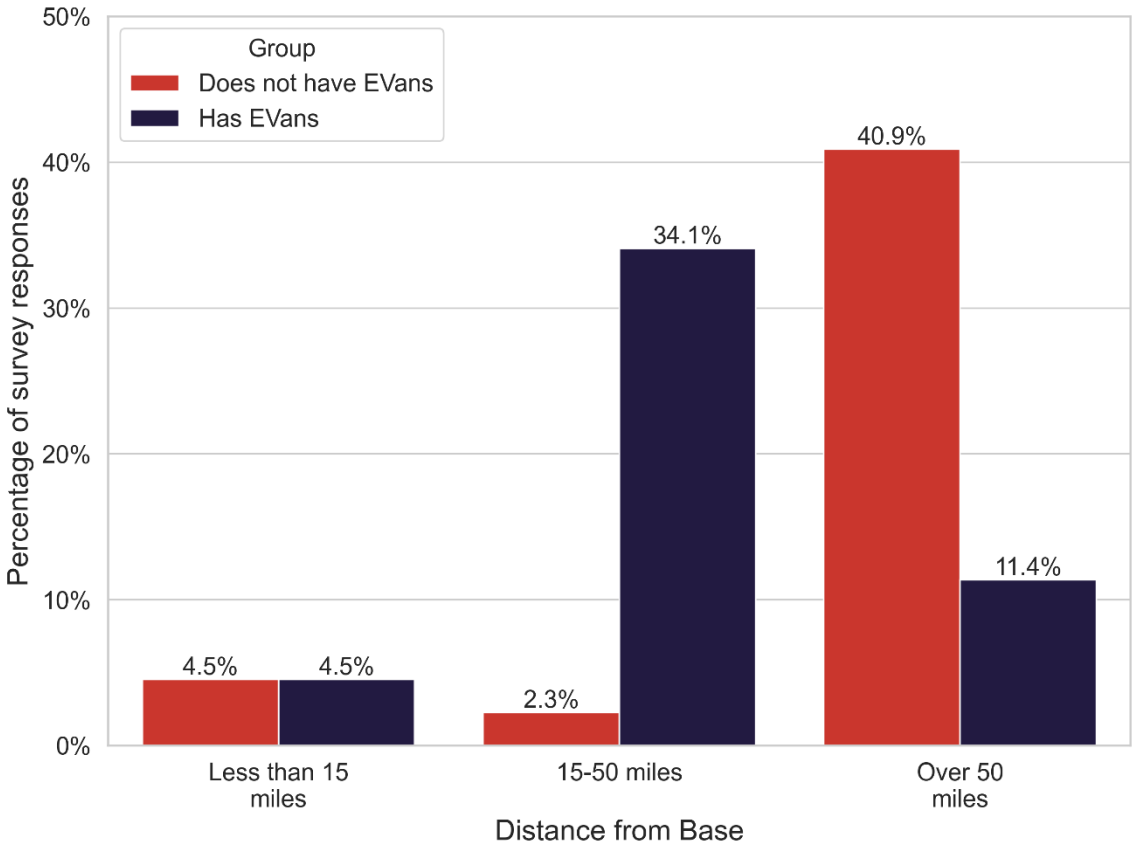
We looked at the proportion of the total fleet that were electric vehicles (Figure 8) and the proportion of all the vans in the fleet that were electric vans (Figure 9 below). The overall fleet size includes other vehicles that organisations may have such as pool cars and HGVs. Figure 8, above, shows that nine survey (20%) respondents did not have any electric vehicles in their fleet, and 27 (60%) reported that less than a third of their fleet that was electric. Nine (20%) reported that more than one third of their fleet was electric – these tended to be smaller fleets therefore inflating the proportion of their fleet that is electrified in comparison to bigger fleets.

Figure 9: Proportion of vans in the fleet that is electric (N=42)



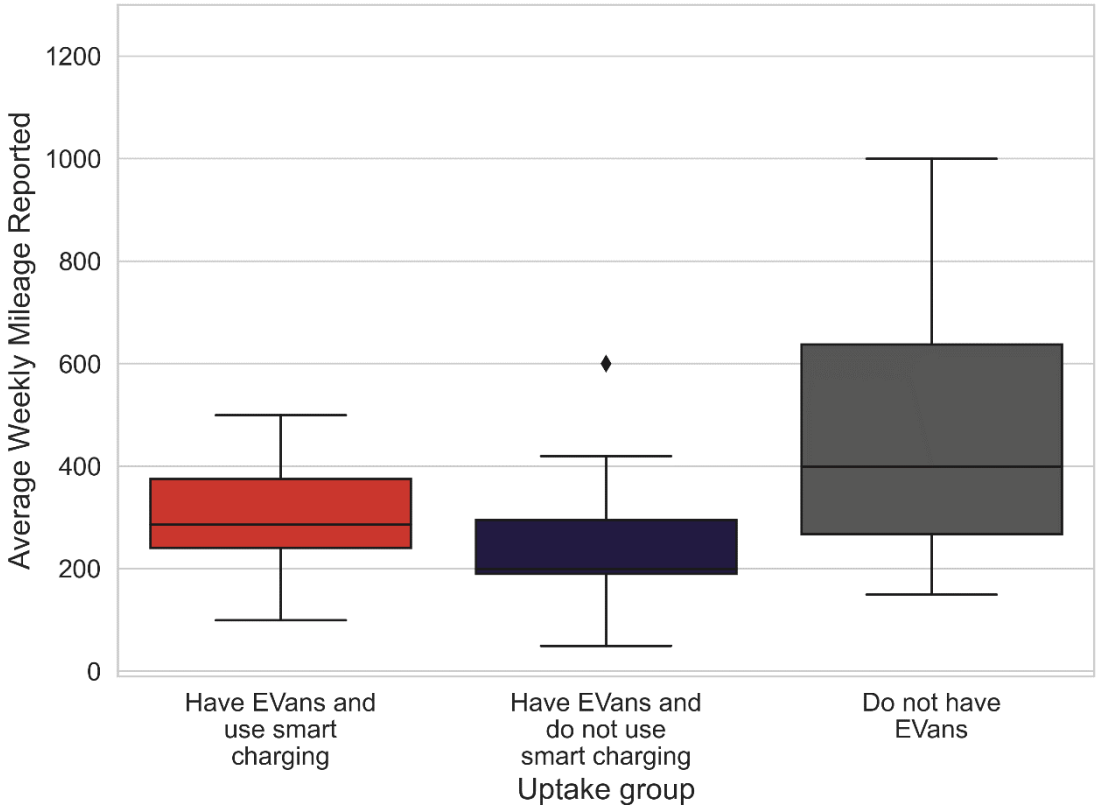
When looking at only the vans in their fleet, fewer respondents had electric vans in their fleet (Figure 9). These results suggest that many of these organisations are relatively early in the phase of adopting electric vans. Battery Electric Vehicle (BEV) vans typically made a larger proportion of the total electric vans in the fleets. Most of them did not have any plug-in hybrid electric vehicle (PHEV) vans in their fleet.

Figure 10: Adoption of electric vehicle by typical operating distance from base (N=44)



Participants were asked how far from the base location did most of the vans in their fleets travel each day. The majority (15; 34.1% of the whole sample) of those with electric vans did their journeys ‘between 15 and 50 miles from their base’ whereas only one participant (2.3%) said their non-electric vans travelled within that distance (Figure 10). Only five participants (11.4%) said their electric vans travelled ‘over 50 miles from the base’ while 18 (40.9%) said that their non-electric vans did that same distance from base. None of the respondents reported operating outside of UK.

Figure 11: Mileage and EV adoption/smart charging (N=43)



Those with more predictable routes or mileage are more likely to be driving an electric van

Operators were asked about the typical weekly milage done by all types of vans in their fleet. Fleets with electric vans reported doing a typical weekly milage of a smaller range – in that the gap between their shortest and longest journey was smaller compared to the gap observed in typical weekly mileage of vans in completely non-electric fleet (Figure 11). This finding was also observed in operator and driver interviews suggesting that electric vans are less likely to be adopted by organisations who do journeys that vary greatly in mileage. Van drivers driving non-electric vehicle typically said they tended to driver a longer mileage and/or unpredictable routes, whereas the electric van drivers had report driving shorter distances and had more fixed routes. Some drivers reported feeling less comfortable using an electric van when they drive on unfamiliar routes or when the electric van was not fully charged.

4 Enablers and barriers to adopting electric vans

This section sets out the barriers that were reported by operators and drivers who participated in this research. Findings are based mainly on interviews with drivers and operators. Barriers are broken down by motivational barriers, opportunity barriers and motivational barriers, in line with the COM-B framework. The COM-B framework assesses a person's ability to change their behaviour depending on their capability, opportunity and motivation (The Decision lab, No date). Note that Operators (O) and Drivers (D) are denoted by the letter O or D followed by the participant number i.e., D5.

There is existing research which looks at the barriers to the uptake of electric vehicles. Some barriers set out in this section are new, while some simply corroborate existing findings with new anecdotal evidence. The most relevant pieces of existing research referred to here are:

- Van Statistics 2019-2020 (DfT, 2020)
- Analysis to identify the EV charging requirement for vans: Final Report (Element Energy for the Climate Change Committee, 2022)
- Electric Vehicle Report (Logistics UK, 2023)
- Consumers, Vehicles and Energy Integration: D6.1 Fleet Study (Chappell et al., 2017)
- Smart electric vehicle charging: what do drivers and businesses find acceptable? (Sharp, Delmonte and Jenkins, 2019)

Motivation to adopt electric vans

Operators who were consulted generally seem motivated to adopt electric vans

Both operators and drivers who were consulted seemed supportive of the adoption of electric vans in theory.

Their motivations to do so fell into a few categories.

Meeting Net Zero targets set by either the government, or internally was a common reason cited for adopting electric vans. This was the case with both public and private sector organisations, but typically the former was more likely to state wanting to 'lead by example'.

> *"The previous Director brought in a sustainability 2030 target of achieving carbon net zero." O03*

> *"[The] Council has to set an example and go for zero emissions as soon as we can" D42*

Overall, all operators were aware of the 2030 government deadline. One operator reported that, from conversations they had been having with other organisations, they felt there was less awareness of the 2027 target around decarbonising government fleets.

Corporate Social Responsibility and personal values were given more of an emphasis by other operators. These businesses may or may not also have been driven by environmental targets, but individual fleet operators were the ones driving the business to transition.

> *"…alarmed to learn that Highlands of Inverness was the 6th most polluted street – [I] want to improve that for my community" O02*
>
> *"I think it's the moral and ethical thing to do. Despite my age I do care about the environment." D14 (also an operator)*

As well as environmental and moral reasons, it was also commonly mentioned that having electric vans were better for business. The use of electric vans could contribute to winning tenders as it appealed to customers' environmental values and requirements. Previous research similarly found that some fleets adopted plug-in vehicles in response to public sector customer requirements to demonstrate their sustainability credentials (Chappell et al., 2017). At the very least, most operators acknowledged that the transition towards electric vans is 'the way things are going' and it was a requirement to adopt electric vehicles to keep up with their competitors.

> *"Customers have an aggressive environment strategy so [it] was essential to maintain business." O40*
>
> *"[talking about questions in tender exercises] …what's your CO2 impact on the UK kept coming up more and more and our competitors are of course going electric as well" O21*
>
> *"Good sign for the business when people see you drive up in an electric van, it sort of shows you care." D14 (also an operator)*

Likewise, those who had already adopted electric vans cited lower operational costs: the cost of charging is cheaper for the same mileage than cost of fossil fuels and their alternatives (such as Hydrotreated Vegetable Oil (HVO)). Other cost savings mentioned by both operators and drivers included not having to pay road tax and congestion charges in dense urban areas.

> *"1.2 million on diesel – inflation went up [by] £200,000 – goes up year on year. Couldn't maintain costs so went electric…save about 1 million a year on maintenance and fuel" O38*
>
> *"We plug it in and charge it at their [the client's] place, it doesn't cost us anything… and the road tax is really low… well it's non-existent… I'm not going to say it's free motoring but it's a hell of a lot cheaper" D21*
>
> *"Works a treat, they save you money and pay for themselves." D40*
>
> *"It also has the benefit of no road tax, which they reversed in the last budget didn't they… you just took away one of the biggest carrots for people switching" D14 (also an operator)*
>
> *"We do a lot of work in the city centre, so we would've got charged for the Euro 6" D22*

Operators were asked about cost savings during the survey. Five participants responded to the question 'Based on your recent and current operational needs, how long would it take for the

organisation to achieve 100% returns on purchasing EVs and smart charging technologies?'. Participants gave a range from two years to 10 years, with three participants stating in the region of 2-3 years. Three additional participants reported that it was hard to quantify the time period, given the variety within the fleet and the multiple variables to consider.

> *"Such a varied fleet. 3 years for vans to 15 years for minibuses and cage tippers." O38*

> *"If investment in charge points is included that we never achieve 100% returns. [There are] Too many variables to quantify at the moment." O41*

However, most drivers who were consulted weren't as motivated as operators

In most cases, especially the bigger fleets, drivers were not the decision makers and simply followed the top-down direction of their business. Some drivers, often cited by operators as the older drivers, were apprehensive about or resistant to change.

> *"They [drivers] were initially hesitant - it was new, they were not used to silent vehicles, had range anxiety, and concerns about their ability to undertake their work efficiently" O21*

> *"Wasn't my idea to do it, just a green idea which somebody had" D21*

> *"The 2030 deadline is not going to happen is it, they're going to have to go down the route of using some hydrogen fuel cell or they'll look at petrol and say oh it's nearly all ethanol anyway" D21*

Similarly, drivers tended to care less than operators overall about any financial benefits which would arise.

> *"[You can help drivers by saying] 'Here are some EV specialist home energy tariffs to help you navigate that and get a lower cost of energy'. But again, it's like, 'but it's not my energy. It's going in the van. Why do I care?" O22*

> *"We're not too cautious about the diesel, because it's not coming out of my pocket obviously" D24*

Opportunity to adopt electric vans

Operators consulted struggled to see the cost savings in practice

Operators who were consulted as part of this research cited up-front costs as a barrier to uptake. This was especially relevant for some smaller fleets who cited the disparity in upfront purchase costs of EVs (and any accompanying charging infrastructure) compared to standard Internal Combustion Engines (ICEs). This finding was also identified in previous research (Chappell et al., 2017; Logistics UK, 2023). Moreover, the Fleet Study Report (Chappell et al., 2017) found that operational suitability and costs of ownership (particularly leasing cost or upfront purchase cost, and depreciation losses) were the most important vehicle selection considerations for various types of fleets.

> *"The EV equivalent is twice as much to buy (£60k instead of £30k)" O22*

“We’re in a remote location. One quote we got was £5m to put in a substation for just one site [out of 16]” O39

“I think what concerns probably a lot of companies… at the moment… is quite a hefty cost to the set-up fees” D17

It was unclear if all participants were aware of the government Workplace Charging Scheme and EV Infrastructure grants. Some operators who had adopted electric vehicles reported that they had taken advantage of government grants and were grateful for them. A few others felt that, despite these grants, there was a large outlay in up-front costs.

On top of the initial costs, there was a perception that operational costs would also be expensive compared to ICEs. This was because the increase in energy prices were explained by a few as not making the benefits worthwhile. Charging on the public network was also thought to be expensive, given the desire to be time efficient by using only the rapid charge points. This suggests that whatever option operators chose – investing in private infrastructure or charging on the public network – transitioning to EVs would be an expensive undertaking.

"The public charge points would have to be significantly cheaper. You're wiping out the financial incentives to go electric by doing that [charging on public chargers]." O16

Operators and drivers felt that vehicle range wouldn’t allow them to operate as they currently do

Participants highlighted that the mileage range of electric vans in the current market does not match their ICE (mostly diesel) counterparts, meaning that not all journeys can be completed with electric vans (without recharging). This limited the proportion of the fleet that organisations chose to electrify.

"I believe they're looking into it, but due to the mileage we cover, I don't think it's going to be feasible to go fully electric." D8

“To be brutally honest, I don’t really like it. Lovely and quiet. Feels like a normal car. But always looking at the charge levels.” D21

“Only have electric vans for staff who work within 50 miles, and definitely within the range of the EV. Would be hard to roll out to those who do much longer journeys.” O27

Moreover, it was often stated by operators that the real mileage was not always the same as the advertised mileage, as adding weight to the vans reduces the range. The Electric Vehicle Report (Logistics UK, 2023) similarly found that operators did not rely on manufacturers’ claims about maximum mileage, and as a result only deployed electric vans on shorter routes.

“Once you’ve loaded up with your material and your tools, you don’t fully get the full range it’s telling you due to the weight” D08

This was combined with a reluctance to recharge mid-way through a shift, both due to the perceived inconsistency and inadequacy of the public charging network (see below), and the extra time involved for charging when compared with an ICE.

"I sit on the fence a little bit with electric because it's a lot of a faff really isn't it, when you could just go to the petrol station and put petrol in" D03

Sometimes the options for charging seemed impractical

Participants acknowledged that they would need to find a solution to charging their vehicles – but participants reported some complications with all the three charging options –charging on the public network, charging at home and charging at the depot.

Charging on the public network

Both drivers and operators stated that the availability of public/ enroute charging points are limited. This was perceived to be especially problematic for those driving unpredictable routes, as they were unable to rely on using charging points they already knew about.

Some drivers who drove electric vans had experienced charge points which were out of order, or which had long queues.

"I'm not against electric…but it needs to be done properly. EV vans and the accompanying network are just not suitable for the business" O17

"You'll find a charging point on the app, drive all the way there and when you get there it's out of order, so it's just frustrating because obviously you've used your charge to get there and not be able to charge when you get there" D12

It was also stated that charging during a shift takes too much time out of the working day. A few operators spoke about the time-critical nature of their businesses – this was especially true for those who were required to complete a certain number of jobs or deliveries each day.

"[We don't want them charging during the day because] The drivers are measured on how many jobs they do a day, and feedback from the client [including whether they are late]. If drivers have a less than 85% satisfaction rate, then the driver loses a percentage of their cash bonus at the end of the year." O15

Not only did drivers report that they had experienced long queues for chargers to be available at motorway services, but they felt that charging itself took too long. Some reported that rapid chargers take 20 minutes to get a sufficient charge, which is still much longer than refuelling an ICE. One operator mentioned situations in which they had been fined for overstaying the free parking limit at motorway services because it took so long to be able to use a charge point.

"Sometimes even when you find the charge points - it may not always be available to use or has a long queue" O40

"You can go next to a light pole and charge there, but you only get 7kw/h which is horrendous, you realistically need a minimum of 50-150kw/h… when you get further out of central London there needs to be more charging points" D37

"If I've got a lot of mileage to cover and need to charge during the day, you've got to use the quick chargers at the service station, and they can be full or busy which can affect

your day and put you behind… I don't even know why they put the slow charges – who wants a slow charger?" D3

"We are starting to pick up parking tickets now where you've had to come off on a motorway service station, you're waiting to charge, and it's taking you two hours before you can get on the charging network, and then because you physically can't get anywhere, you're getting fined" O17

One operator mentioned concerns about workplace law and health and safety in relation to charging. They were unsure whether finding a charge point and charging a vehicle would be considered as part of the drivers' working day or their lunch break, and what the health and safety responsibilities of the employer would be in these situations.

"They'd have to travel to that charge point. That means more driving hours …and then you get into a sort of health and safety debate about, well, when are you not working during this period. Because travelling to a charge point is working, charging your vehicle is working and that means you haven't had a proper break, but you're using equipment and tools." O22

A further point was raised by one individual that there were issues with vans fitting into the designated parking bays. This was also found in previous research (Logistics UK, 2023).

Charging at home

Some drivers who parked residentially overnight cited not having the space to install charge points. The Fleet Study Report (Chappell et al., 2017) identified this as a major barrier to electric vehicle adoption. Similarly, the Electric Vehicle Report (Logistics UK, 2023) found that not all drivers were willing or able to park their vans at home. While on-street charge points do exist, this was mentioned by one individual as not working in practice at large scale because of the lack of security and the implied risk that the vans would not be charged the next day.

"You need your own driveway, your own garage, somewhere you can plug it in… I don't know how they're going to do it for the whole country at some stage because I can't see them being like parking meters plugged in because kids would just unplug them for a laugh?" D14 (also an operator)

Even for those that did have the space at home to park and charge, both drivers and operators were worried about how reimbursement would work in practice.

"They don't make any saving, they don't benefit personally from this, but they're expecting to make a compromise and then they're trusting that you're gonna reimburse them correctly and appropriately at all times." O22

However, a variety of different options were identified by those who took electric vans home to charge, suggesting that the barrier here is a lack of knowledge about the options rather than a lack of opportunities to do so. For electric van adopters who did charge at home, some operators paid a separate metered supply directly, some drivers paid and got reimbursed, while other drivers would be paid a lump compensation cost (such as half a shift) in order to

offset their charging expenses. Such a variety of reimbursement methods was also found in the previous research (Logistics UK, 2023). For drivers who also had their own personal electric vehicles, a question was also raised about how operators could distinguish which vehicle they were charging, if drivers were footing the bill and getting reimbursed.

> *"We just put them [the home charge points] in, we're an electrical company, so we put a meter on there as well, and as long as they just submit the meter reading to us, all we need to do then is just pay them their usage that they have on their electricity." D40*

As well as reimbursement, there were also questions surrounding ownership and liability of home charge points, especially in situations where employees left the business or moved house.

> *"This was a concern of mine, if he [his employee] ever left, it would be a pain to get it ripped out… I imagine it would just be a case of paying someone to unscrew it, unconnect it and plug it in somewhere else" D14 (also an operator)*

Charging at the depot

One of the main problems cited by operators for charging at the depot was lack of space for either any or additional charging infrastructure to meet the charging needs of the entire fleet.

> *"We have parking spaces but not ones which are convenient for recharging" D06*

> *"If we were to get more electric vans, we would need to have more charging points at offices and depots - but there is a lack of space even for normal parking, never mind having some as designated only for EVs." O27*

Another commonly cited issue, even where space was plenty, was that installing the charge point and ancillary infrastructure was expensive.

> *"We're talking huge infrastructure costs, though we've already looked and none of our sites have got enough power to take the fast charger. We'd have to upgrade the power supply to the site, but it's an average of about £30,000 to do that. Times that by 6 [depots] and then add on the charges on top and then add on the extra cost of the vehicles. It's significant." O16*

> *Referring to a lack of space at the depot: "95% of [the diesels] would be electric tomorrow if we could [swap to electric]" D42 (also an operator)*

For those who did have the space, installation of charge points was still problematic for a few operators as they required permission to make infrastructural changes to the site. This was even more difficult to achieve if the site was shared with others, meaning either that fewer charge points would be granted permission or that charge points would need to be shared with others, thus reducing their capability for the business seeking to install them. Similarly, if the office building or depot was on lease, this would affect how many charge points could be installed, as well as their power capacity. Challenges involved in obtaining permission from landlords were also identified in previous research (Logistics UK, 2023).

"As a tenant, we have the requirement to have electric vehicles, but not the authority [to install the necessary infrastructure]" O39

A further problem was that the possibility of charging at the depot conflicted with current driver parking behaviour. Many drivers parked residentially, and often don't have time to drive to the depot to charge their vans before starting their shift. Another recurring problem was that drivers did not always park and charge how and when they were supposed to at the depot: charge point bays were often used by vans which did not need charging, thus preventing others from doing so, while other drivers did not plug their vans in at all, leaving them with no charge at the start of the shift.

"Drivers used to arrive in the morning, load up and leave within an hour – now this might be more like 2 hours because they might top up on charge. We stagger it because we [have] got five vans and obviously we've got like 3 charging points" O28

"Sometimes they [the late starters who finish at 12am] come back in and they don't always bother putting the vans on charge, so you've got to go and find another" D38

Some (smaller) operators consulted were struggling to purchase vehicles

The first of these challenges was in finding demonstrator vehicles to trial. Participants suggested that there were not many available, and smaller fleets especially struggled to access those that were, reporting that they thought that larger companies were being prioritised and that these companies would often purchase the demonstrator vehicle at the end of the trial period.

"We couldn't get a demonstrator vehicle because we're not one of the massive companies. And then those companies who got the demonstrator vehicles always seemed to buy them. It took us 6 months to get a vehicle" O28

The second challenge reported was having to wait long periods of time for vehicles to be delivered once purchased – up to two years in one case. It was not clear what the cause of this long wait time was.

"We're still waiting for a couple of them to be deployed because they they've taken two years to come from the supplier...So it's taking an awful long time to get them" O15

There were also a few unexpected issues surrounding larger vehicles

One operator had adopted electric vans and had selected a 4.25-tonne model rather than a 3.5-tonne model because of the larger range it provided. However, they had then experienced costs and logistical challenges because of the additional driver training required for Cat B car licence holders using a government-approved training provider. This was a finding also identified in the Electric Vehicle Report (Logistics UK, 2023).

"The difficulty that the 4.25-tonne option gives us is that there's a driver training requirement and therefore we would need to potentially need to train all our drivers because it depends, you know, who's on shift in which location, who's available." O39

Problems with servicing were also shared by those who did not operate the heavier vehicles. One driver mentioned that the mechanics in his company who service the diesel vans are not trained to repair the electric ones they have, meaning that they would require an additional time and cost to be competent.

> *"The other slight problem they [the operators] have is that we have our own mechanics and none of them are actually trained to work on electric vehicles so if anything were to go wrong, they'd either have to sub-contract or go back to the manufacturer with the van" D27*

Similarly, the requirement for yearly MOTs for 4.25-tonne vehicles in some cases was off-putting, and options for getting vehicles serviced was felt to be limited. The trouble experienced by operators in servicing these vehicles was also shared by others operating lighter electric vans, who found that options for getting EVs serviced were limited.

One operator also reported that they would not be able to use an electric van to tow trailers due to existing regulations.

In relation to these points, it should be noted that a recently published consultation response confirmed that the Government will be removing the additional driver training requirements. In addition, an ongoing consultation has asked about potentially amending the MOT requirement for a 4.25-tonne electric vehicle.

Capability to adopt electric vans

Many operators who were consulted were unsure where to start with electric van adoption

Some operators weren't sure where to start with adopting electric vans and were unsure where to go to for advice. Rather than being encouraged to transition, many felt that they had been given a deadline, but hadn't proactively been approached with information about how to meet it.

This was especially true around upgrades to charging infrastructure at depots. One operator had experienced delays in finding and getting someone to come and survey the site.

> *"Who do you ring up and ask? Who do you get to come and survey the site and tell you what you need?...There isn't a customer service face to those network distributors and operators." O22*

Operators felt that switching a van fleet from diesel to electric is a big logistical task, involving many different elements and information and permissions from many different places. Uncertainty over costs also meant that they struggled to plan – something which was also identified in the Electric Vehicle Report (Logistics UK, 2023).

"How long the vehicles last for… how long the batteries last for, as in the lifetime of them… are the servicing costs different on an electric vehicle compared to diesel and petrol?" D17

Individual challenges were only compounded by the feeling that there was a lack of a joined-up approach between organisations. Some operators felt there was a lack of a strategic view of charging infrastructure.

"Currently it is 'you do what you need to do, and we'll do what we need to do 20 yards down the road' – not a joined-up approach." O39

"There's a lot of work to be done and a lot of joined up networking, and the pricing needs to be right for it to work, and there needs to be more discipline on the network… there needs to be someone who grabs it by the horns and drags it in the direction it's going, because at the moment nobody is doing that" O17

Furthermore, not only do operators have to educate themselves, but they also must educate their drivers about using a new vehicle. For some, this in-house training about charging could seem complicated and time-consuming. For others, such training was thought to be ineffective.

"How much can you really control what time they charge, especially for home charging" O41

Vehicle manufacturers were one of the main sources of information for operators

Manufacturer websites were a key source of information and enabler providing operators with what they needed to know. Often, businesses were speaking to manufacturers to get information about the vehicles or trying to arrange demonstrator vehicles. Other sources included energy suppliers, industry magazines, networking (both formal and informal), and commercial vehicle shows.

"I know both UK and international directors of all the major brands and I'm constantly speaking to people and understand what's coming, when's it coming" O17

"You get your information from your vehicle provider and from your EV energy provider" D14

5 Charging requirements, preferences, and practices

This section sets out how and when electric vans were being charged, as reported by the operators who responded to the survey, and supplemented by interview data.

Typical charging hours

Figure 12**: Distribution of typical charging times of electric vans (N=32)**

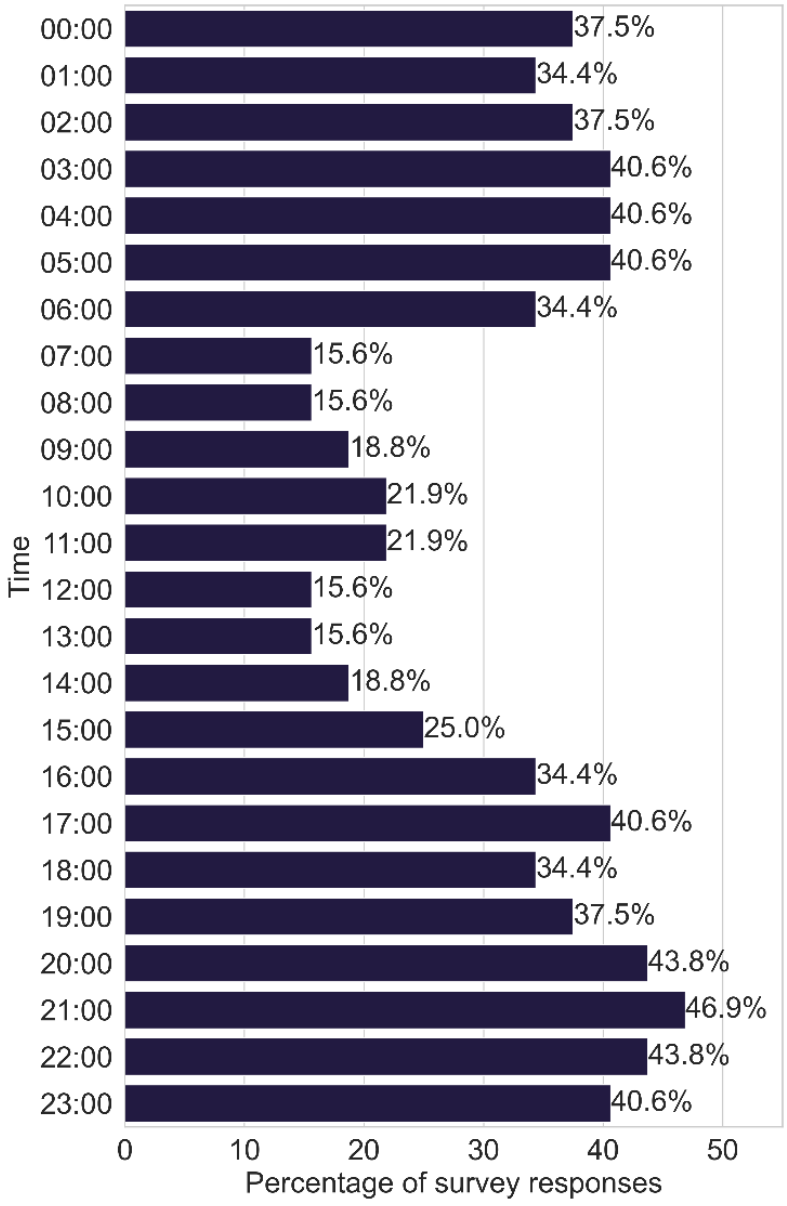


Figure 12**Error! Reference source not found.** shows the distribution of typical charging times (rather than plug in/plug out times) of electric vans gathered from the operator survey. Fewer

operators reported charging between 0700 and 1600. This is supported by interview findings where most of both operators and drivers indicated their typical van driving hours were between 0700 and 1700, and a small proportion stated slightly longer typical hours starting from 0900 to 1800. Some stated that they would return the vans to the respective charging site earlier if their work concluded at an earlier point. Most of the charging was reported to be done overnight (i.e., hours between 2000 and 0700 the following day).

Parking and charging site during the day and overnight

Operators were asked where their electric vans were charged and where their non-electric vans were parked during different times of the day. Day time was defined as hours between 0700 and 2000 and overnight was defined as hours between 2000 and 0700 the next day.

Figure 13: Typical charging site for electric vans during the day (N=46)

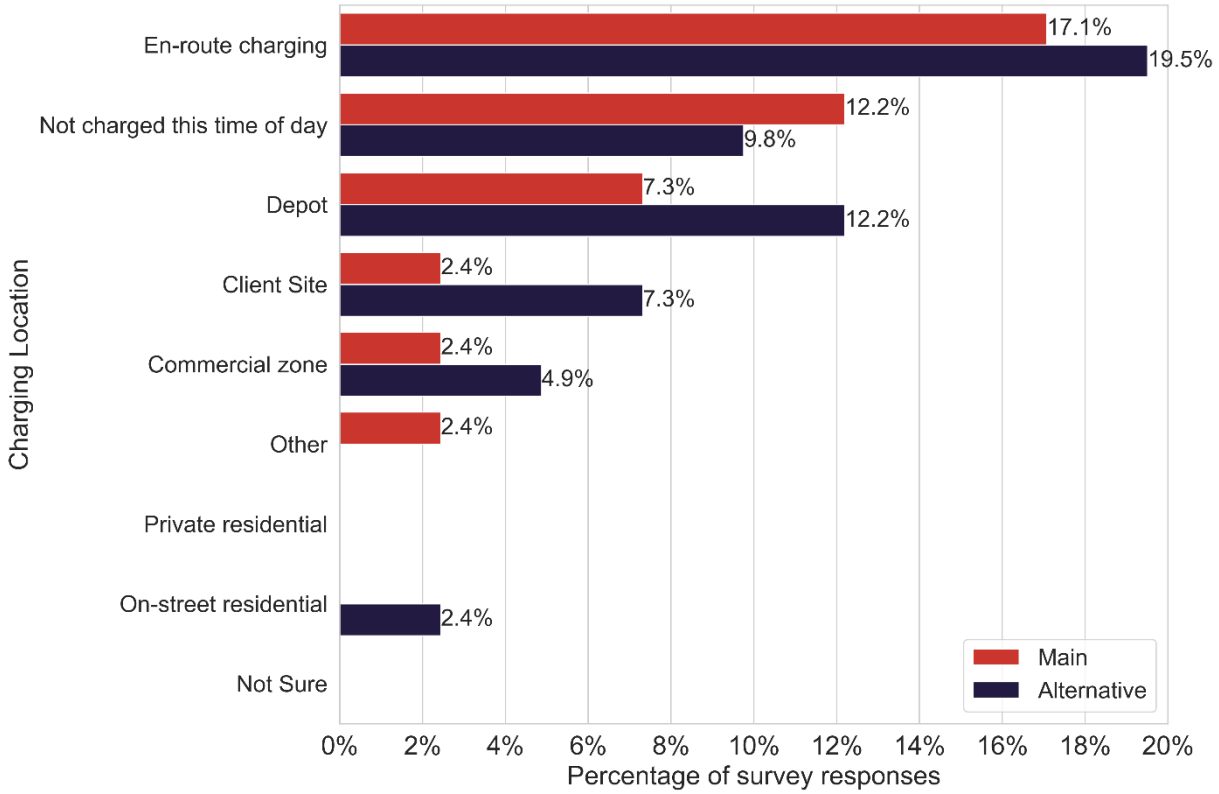


Figure 14: Typical charging site for electric vans at night (N=46)

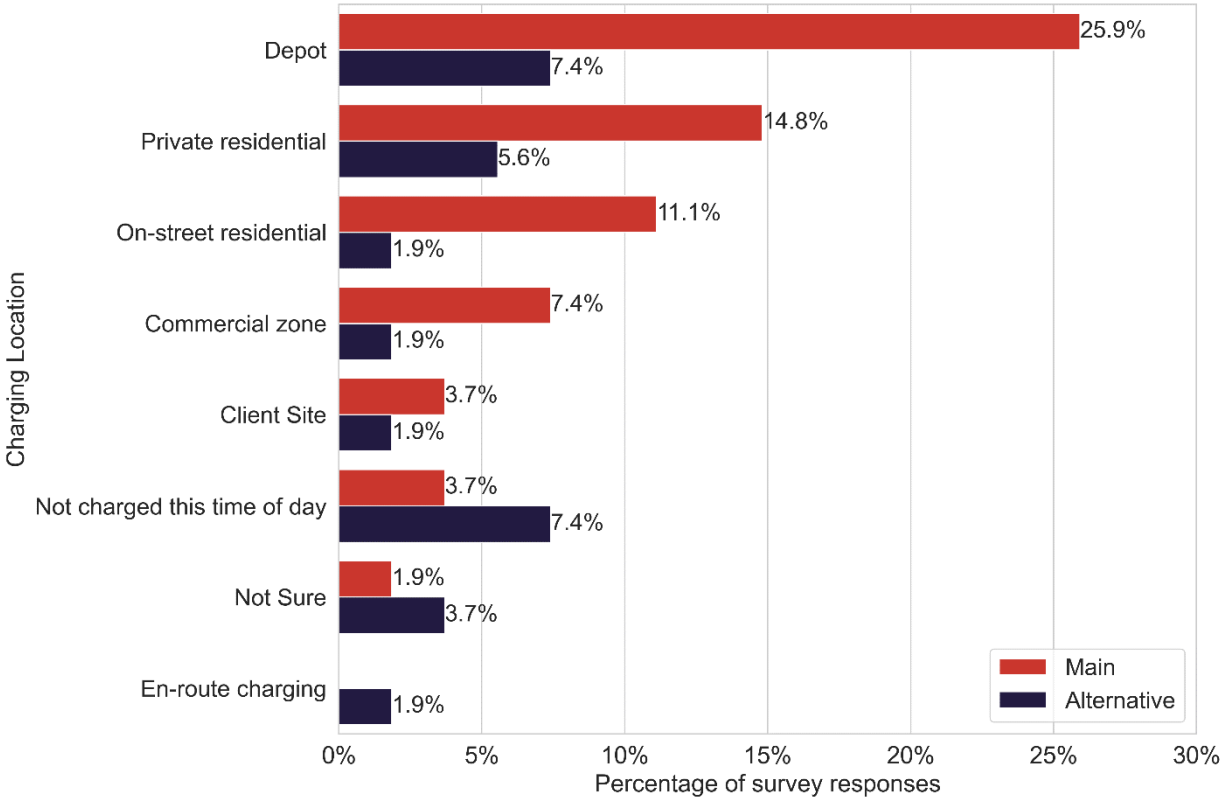
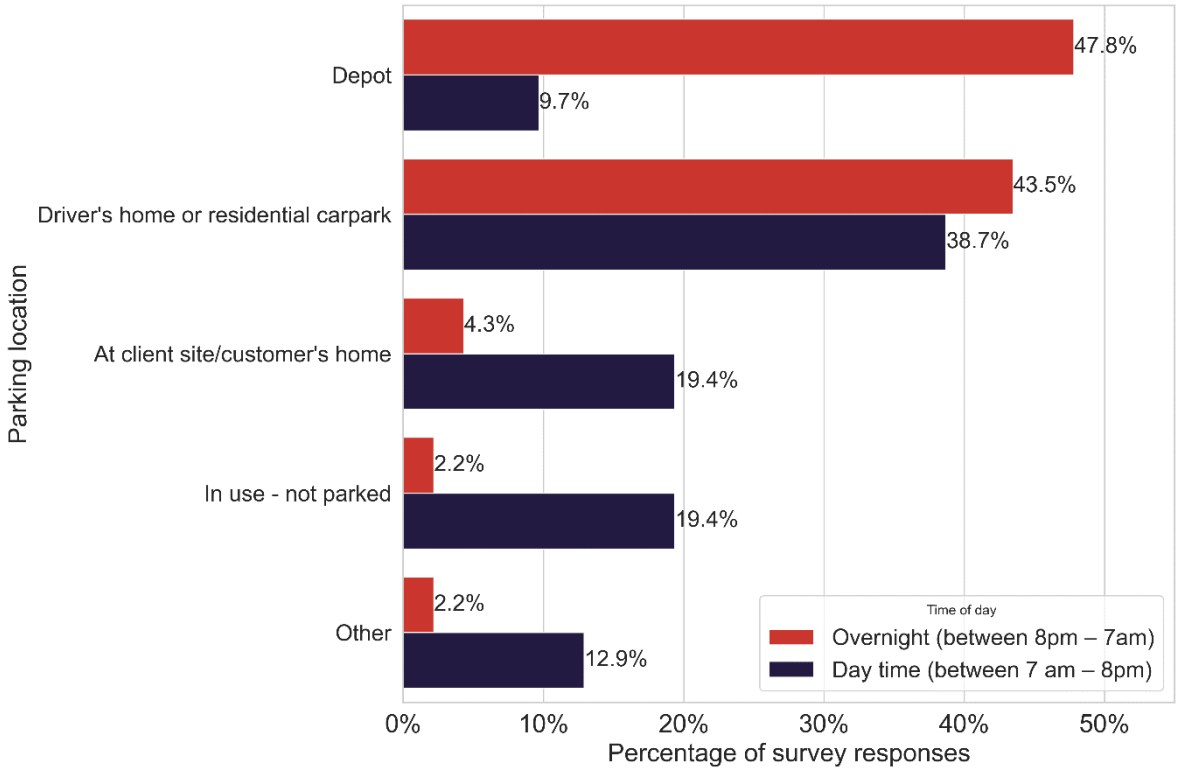


Figure 13 and Figure 14 show the distribution of responses of where operators typically charged their electric vans during the day and overnight. During the day, enroute charge points were reported to be the main charging site (17.1%), followed by the depot (7.3%). Charging in the daytime was mostly reported as an alternative, suggesting that it was not typical to be charging at the selected sites during the day, and would be done so in case of emergencies. Interview findings suggested that vans are typically in use during the day, and enroute charge points were mentioned by operators/drivers who did longer journeys and needed to top up during the journey. Commercial zones, and client sites were rarely mentioned during the interviews.

At night, most respondents charged their electric vans at the depot (25.9%) or using private (14.8%) or on-street residential chargers (11.1%). Data from driver interviews showed that more electric van drivers reported leaving their vans at the depot overnight. Of the driver interview sample, 24 electric van drivers parked or had the option to park their van at the depot, whereas only six drivers parked or had the option to park their van at home residentially. In contrast, these respective figures were only four and nine for non-electric van drivers. It might suggest that being able to leave vans at the depot overnight for charging is an enabler of adoption of electric vans in the fleet.

Both these charts also support the findings relating to charging hours (**Error! Reference source not found.** above) where most of the charging is said to be done overnight (i.e., between 2000 – 0700).

Figure 15: Typical parking site of non-electric vehicles overnight and in the day (N=39)



Operators were also asked where their non-electric vans are parked at different times of the day (Figure 15). Most of the respondents had their non-electric vans parked at the depot (47.8%) or the drivers' home (43.5%) overnight. A small number of non-electric vans were parked at client sites/customer homes, or at other places such as garages, body shops, or truck stops. Note that participants could select multiple parking sites for the respective time of the day.

The operator survey data shows that both electric and non-electric vans are commonly parked at depots and homes overnight. However, the interviews with drivers found that more electric van drivers reported leaving their vans at the depot overnight compared to those who parked it at their homes/ residential parking. In contrast, these more non-electric van drivers said they parked their vans at their homes/residential parking than at depot.

Leaving vans at the depot overnight for charging could be an enabler of adoption of electric vans in fleets. This is because operators are more likely to have control over installation of charge points at work sites, compared to their employees' homes. Using home/residential chargers introduces its own set of challenges that have been discussed in detail above (Charging at home) in the enablers and barriers to adopting electric vehicles.

Number of times a day an electric van is plugged in

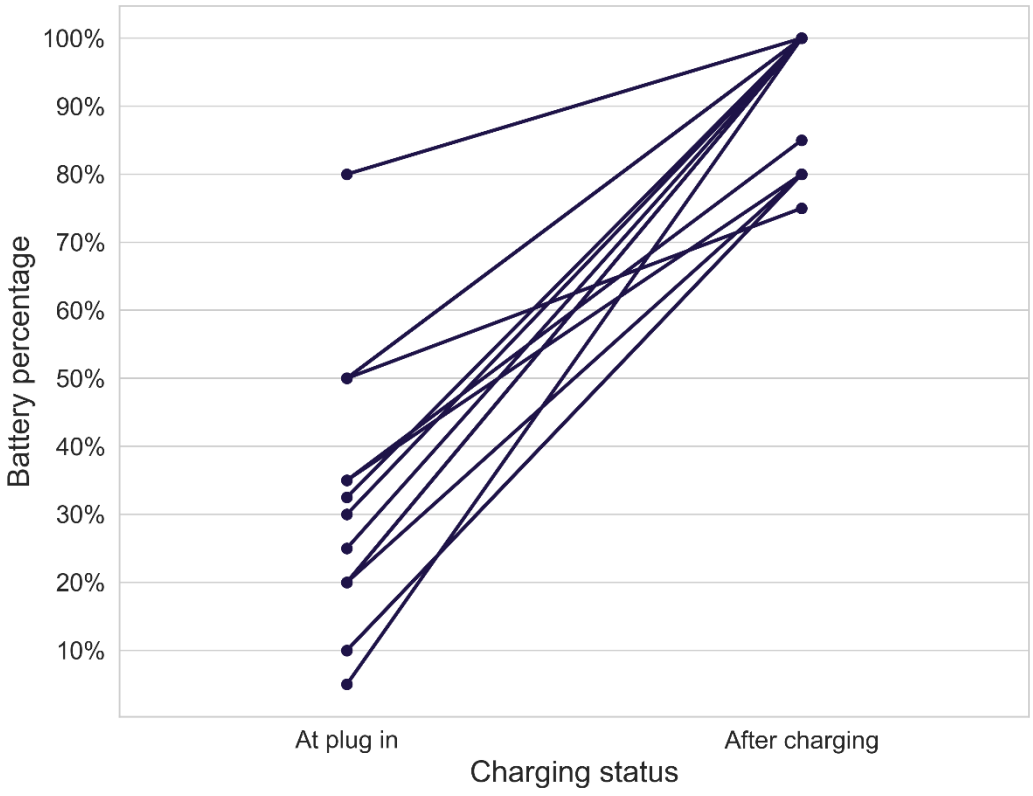
Table 3: Typical number of times a day an electric van is plugged in

Number of times plugged in a day	Sample total
0.5	1
1	17
2	2
4	1

17 out of 21 responses indicated that it was typical for their electric vans to be plugged in only once a day (Table 3). One respondent stated that their electric van was plugged 0.5 times a day which may mean that they plug-in their vehicles every other day.

State of battery at plug in and plug out

Figure 16: Distribution of typical state of battery at plug in and plug out (N=18)



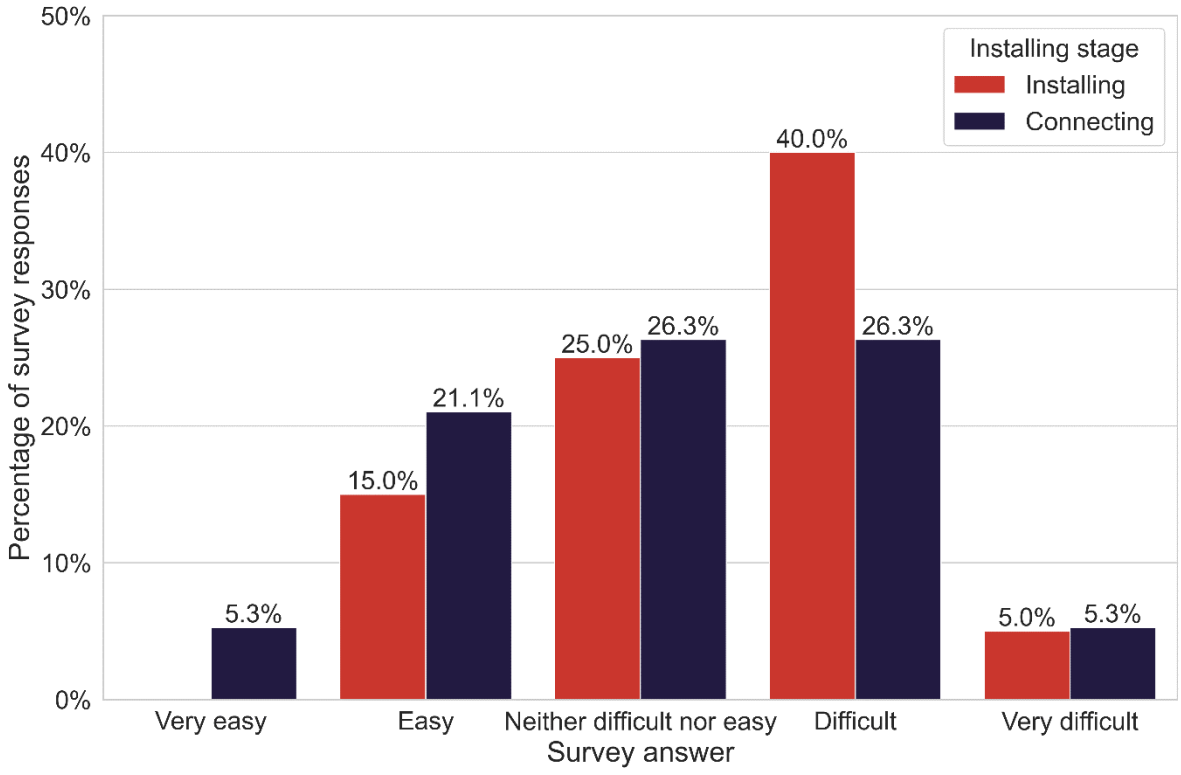
The average state of battery reported at plug in and plug out was 35% and 93% respectively (Figure 16). While the majority stated the typical state of battery at plug out was at 100%, five respondents (28%) stated a lower percentage between 75-80%. Operator interview findings provided some insight about why the vehicle may be unplugged before reaching 100% state of charge. Some operators mentioned some of their fleet would only need to be charged once every 1-2 days due to shorter daily mileage covered by those vans, while other electric vans that completed longer distances needed to be charged daily. Driver interviews also suggested that where there were limited charge points at the depot, vehicles needed to be reparked to make room for another electric vehicle to be charged. This would also explain why vehicles may be plugged-out before reaching a full charge.

A small number of driver respondents said they were not comfortable driving a van without full charge. These drivers reported choosing a non-electric van for their journey over an electric van that is not fully charged, provided there was a van of choice available.

Only 16 operators provided the typical battery size of their electric vans. The average battery size of the electric vans reported was 77.6 kWh. We did not find any correlation between battery size and the stage of battery charge at the end of a typical charging session.

Ease of installing charge points

Figure 17: Operators' experience of installing and connecting charge points (Installing sample size: N=20, Connecting: N=19)



There was mixed feedback provided about the ease of installing and connecting charge points (Figure 17). Issues related to charging are detailed on page 30 and categorised by the different charging locations.

How drivers are reimbursed for charging away from depot

Operators were asked how drivers were reimbursed for the cost of charging the electric van when it was charged anywhere other than a work site/depot. The survey and interview respondents suggested there were three common ways of doing this – using smart enabled chargers installed at employees' homes, via a physical or digital company fuel card, or by asking drivers to claim the amount based on energy usage, e.g., energy bill.

Reimbursement via the use of smart-charging enabled technology was done using bespoke systems. Participants said they helped them to simplify electric vehicles charging and provides them with electric vehicle charging insights and carbon reporting.

> *"Drivers just use whichever supplier and tariff at home, and MINA links in with that"* O15

> *"…Payment is sorted by Mina card"* O35

A physical or digital company fuel card was mentioned by various operators, especially those who anticipate their drivers needing to re-charge their electric vans on route. Some said that they did provide their drivers with company card that the driver can charge the expenses to but did not anticipate them needing it. Digital fuel cards were in the form of mobile phone applications that required the driver to have the mobile application and set up with the company's credit card.

Finally, a small number of drivers reported that had the option to submit a claim for expenses relating to charging the electric van by manually submitting a bill or receipt. This process normally takes 2-4 weeks and the majority of those who had this option said they would avoid charging outside of the depot/ home (or other main charging site) unless it was particularly urgent.

Reflections on archetypes

As stated in the 2 Methodology section, both operators and drivers of electric vans were categorised into a driving archetype (created and defined in Element Energy, 2022) in order to give a good indication of how the vans were used each day, and to assess whether barriers to adopting, operating, and charging electric vans were shared across these use-case groups.

Table 4: Operator and driver archetypes

Archetype	Operating area	Overnight charging location	Daytime charging location	Sample total
1	Within 15 miles of their base	Residential	Public	0
2	Within 15 miles of their base	Residential	Private	1
3	Within 15 miles of their base	Depot	Public	4
4	Within 15 miles of their base	Depot	Private	6
5	Between 15 and 50 miles of their base	Residential	Public	5
6	Between 15 and 50 miles of their base	Residential	Private	4
7	Between 15 and 50 miles of their base	Depot	Public	6
8	Between 15 and 50 miles of their base	Depot	Private	6
9	Over 50 miles from their base	Residential	Public	0
10	Over 50 miles from their base	Residential	Private	1
11	Over 50 miles from their base	Depot	Public	9
12	Over 50 miles from their base	Depot	Private	4

During this present research, the archetype framework was a useful way to approach the topic and give a good initial overview of what an individual van's journey across the course of 24 hours would contain.

However, using this framework in practice came with challenges, based on just how extensive, complex, and varied a van's journey during the day can be. It was often hard to allocate a participant to a specific archetype for several reasons:

- Some drivers don't charge during the day at all, making the allocation to public and private infrastructure redundant.
- Some drivers have the choice to either take their vans home each day or leave them at the depot – their decisions would often be framed around what the next day's schedule of jobs contained. This meant that they didn't sit within one archetype.

Not only were there overlaps between archetypes, but there were many differences and nuance within a single archetype. For example, on paper, drivers may undertake the same type of journey (e.g., sharing an operating area distance and average daily mileage), but their driving could vary from one long drive to a single destination to a handful of jobs to over 100 delivery stops.

Bearing in mind the above caveats, Table 4 (replica of Table 1) above shows how the sample looked in terms of archetypes, based on the research team's best allocation.

When using the framework as an analytical tool to identify shared experiences and barriers, the archetypes did prove useful in identifying which types of problems an individual operator or driver might be experiencing. However, it was not found that individual archetypes experienced specific problems which were not shared by other archetypes.

Some barriers were more generic and could be experienced by any archetype. For example, space constraints were problematic both for operators who parked their fleet at the depot overnight and for those whose drivers parked residentially. In this respect, the archetype framework does contain gaps, and is not a catch all for identifying exactly which barriers a particular business might be experiencing. Nevertheless, it is still a useful starting point for identifying an initial set of barriers.

6 Use of smart charging

This section sets out how many of the operators and drivers who were consulted were using smart charging approaches.

The following definition of smart charging was used during this research.

Smart charging means you can intelligently manage how your electric vehicle charges. When a vehicle is 'smart charging', the charger is essentially 'communicating' with your car, the charging operator and the utility company through data connections. This technology enables things like charging when energy prices are lower or sharing energy from the vehicle battery to a building or back to the grid.

Number and type of charge points participants had

Figure 18: Number and type of charge points owned by operators surveyed

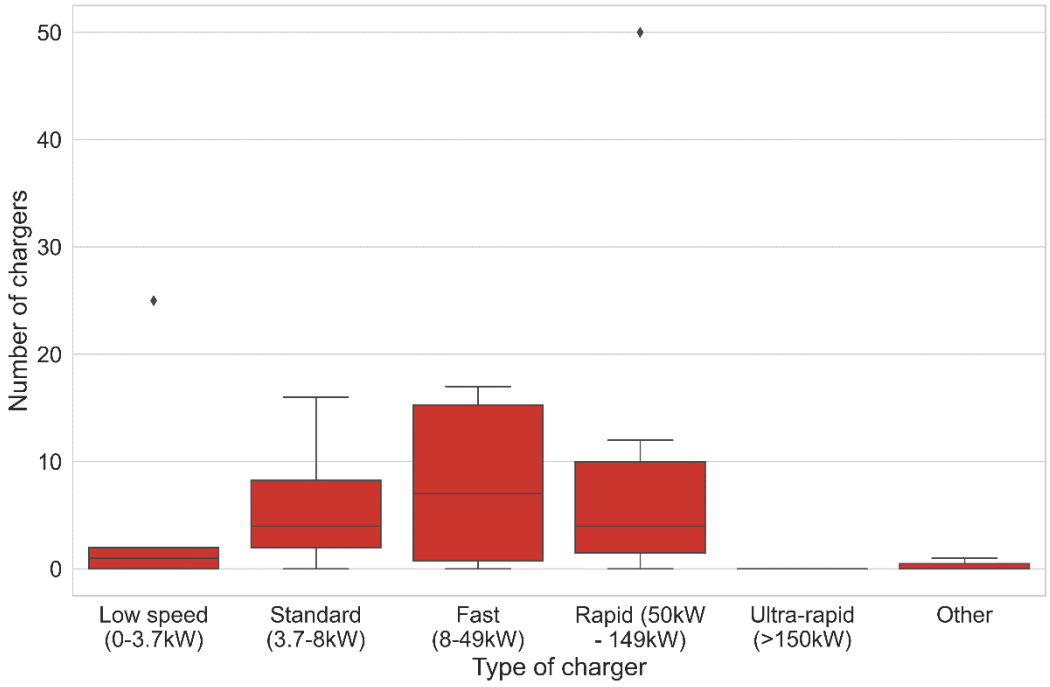
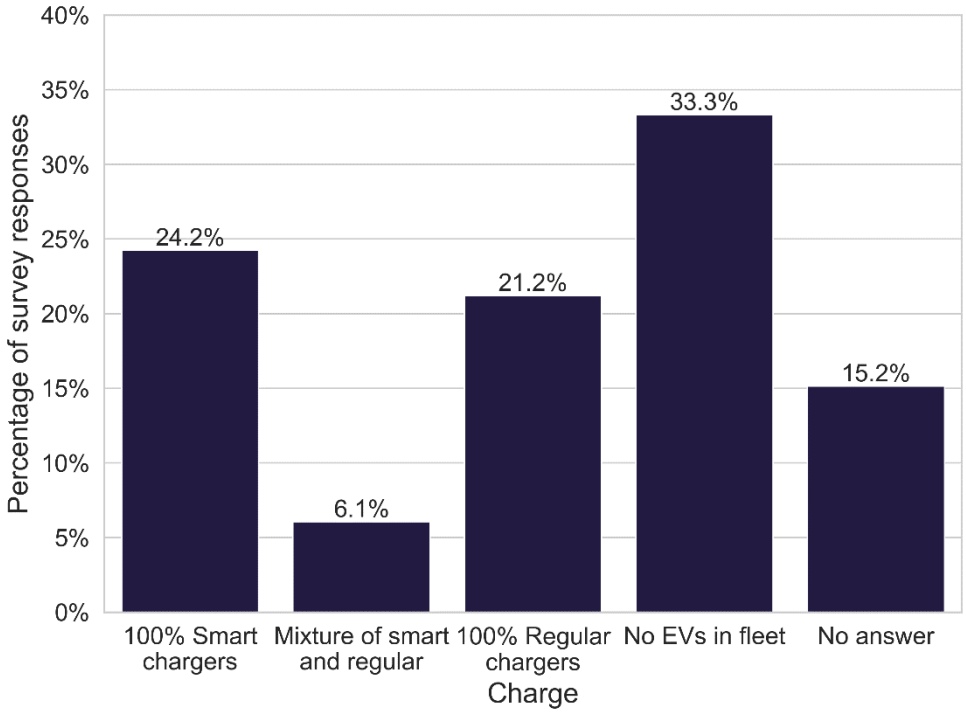


Figure 18 shows the distribution of type of charge points operators had at the point of the survey. Most operators had standard, fast and rapid chargers of varying numbers. Bigger fleets tended to have more charging points as they were also more likely to have more depots/work sites. Some fleets did not own any of the chargers as they had access to the chargers owned by the building in which their offices were leased.

Two operators stated they had plans to install more in the near future. Extreme outliers (from eight respondents) have been removed (in this chart only) due to distorting the scale and obscuring other characteristics of the chart. Seven operators had between 100 - 550 charge

points – these were standard of fast chargers. One operator with more than 10,000 vehicles in their fleet stated they had 2,500 standard charging points.

Figure 19: Percentage of fleets and breakdown of type of charging they have (N=33)



Of the 15 operators that had any EVs in their fleet, seven (21.2%) of them had 100% regular charge points, eight (24.2%) of them 100% smart charging enabled charge points, two (6.1%) of them had a mix of smart and regular charge points, and five (15.2%) of them either left the question blank or indicated 0 for both questions (See Figure 19). Eleven respondents (33.3%) had no electric vans in their fleet. Only two operators had a mix of smart and regular charge points. With the exception of one operator, all those who reported having smart charging-enabled points had indicated that they were using one of the four smart charging approaches (Static time of use tariffs, dynamic time of use tariffs, Third party charge management and V2X/V2G) see Figure 20 below).

It could be inferred that those with 100% smart charging enabled charge points are new adopters of electric vehicles, hence all of their charge points are smart charging enabled, but this was not specifically stated by any of the respondents. Whereas those who have 100% regular charge points may have started adopting electric vehicles in their fleet before smart charging technology was introduced (early adopter) and hence 100% of all their charge points are regular charge points. Note that none of the respondents explicitly stated this during the interview.

Use of smart charging

The following definitions of different smart charging approaches were provided to participants.

Static time of use tariff: Static time of use tariffs comprise several fixed price bands for electricity throughout the day, for which the price of electricity is higher when the demand is higher, in order to encourage users to use electricity when the demand is lower. In some cases, installation of a smart electricity meter is required to use a static time of use tariff.

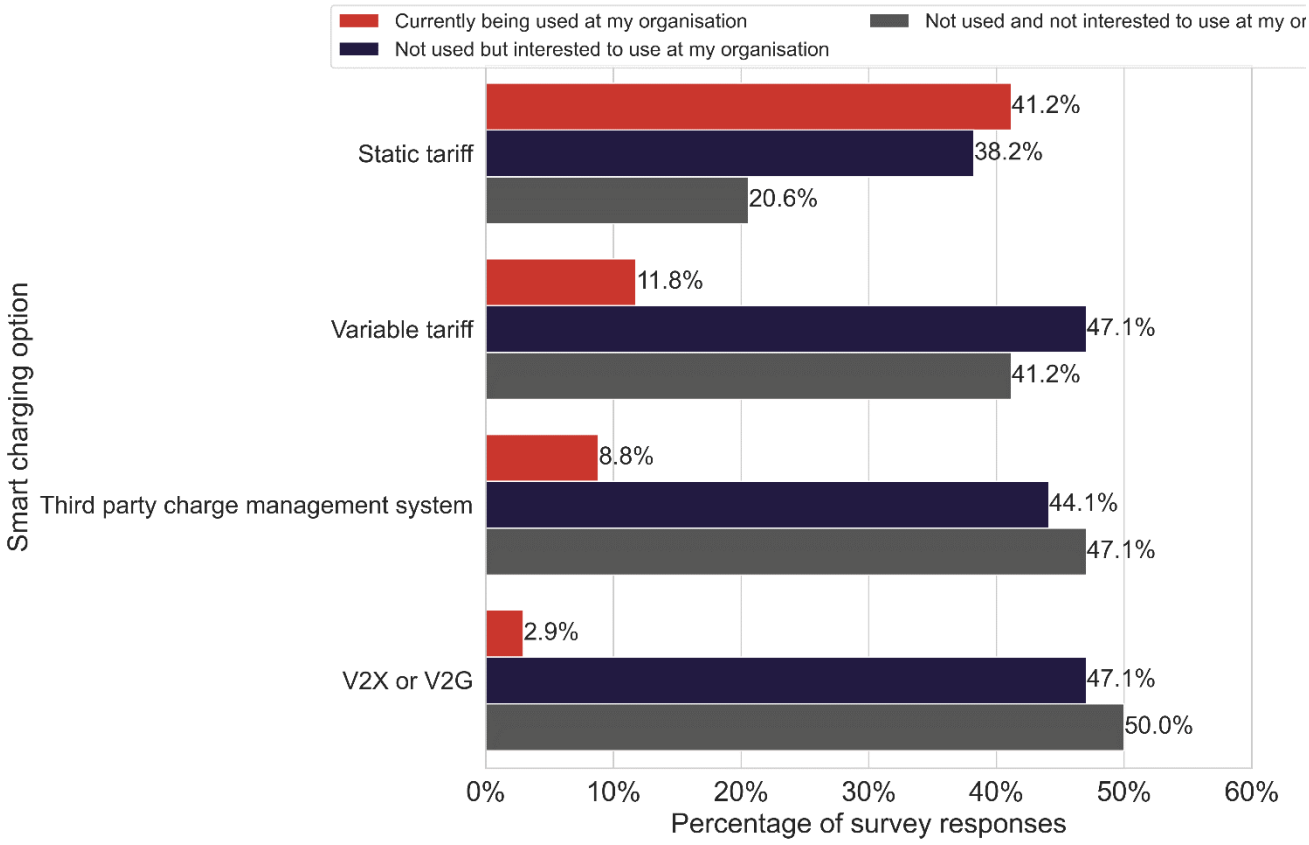
Dynamic time of use tariff: Dynamic time of use energy tariffs comprise real-time or predictive prices for electricity throughout the day, to encourage users to use electricity when the demand is lower. They use a similar principle to static time of use tariffs, however, electricity prices on dynamic time of use tariffs are not fixed and may change as often as half-hourly. These types of tariff also cannot be used in conjunction with prepayment meters.

Third party charge management schemes: Third party charge management schemes allow a third party to directly control the timing and speed of EV charging, so that the third party can find the cheapest way of charging the vehicle when demand is lowest. These types of schemes generally require the user to have a smart charge point installed.

Vehicle-to-grid (V2G): A leading example of V2X – with V2G services, users can return energy stored in their EV batteries to the grid when electricity is in high demand in exchange for financial compensation. This service encourages users to provide energy back to the national grid when the demand is higher. These services require the user to have a V2G-enabled vehicle and charge point.

Vehicle-to-everything (V2X): V2X, where "X" stands for everything, is the umbrella for all forms of technology whereby the EV battery can export electricity back to a system, be that a home (V2H), a building (V2B) such as a business or back to the electricity grid (V2G).

Figure 20: Use of smart charging technology by survey respondents (N=34)



Out of 34 operators surveyed, the majority did not use any of the four smart charging options described to them in the survey (Figure 20). The remaining operators use one or more of the smart charging approaches with the majority (41.2%) using a static-time-of-use tariff, 11.8% using variable-time-of-use tariff, 8.8% using third-party charge management systems, and 2.9% using V2X or V2G services.

These figures need to be read with caution. The interviews revealed there was some confusion about what smart charging is and some respondents could not confidently say which type of smart charging was being used at their organisation. Only five out of 22 operators interviewed said they were using smart-charging approaches during the interview. Some operators interviewed were unsure if their organisation was using smart charging, as they did not have sufficient knowledge of that part of their business operations.

Of those who did not use smart charging, at least half of them were interested in using a smart charging approach in their organisation.

Which types of operators and drivers adopted smart charging?

When looking at factors such as business activity type, region of main base, fleet size, typical distance travelled from base, and typical weekly mileage, the operator survey did not find any distinction between fleets that had adopted smart charging and those that had not adopted smart charging. Both the operator survey and interviews suggest that operators who were

relatively knowledgeable about smart charging approaches have considered adopting it. However, they highlighted other barriers relating to adopting electric vehicles in their fleet to that were a higher priority to overcome. Other operators interviewed were less aware of smart charging approaches.

Drivers interviewed understood the concept after smart charging was explained to them during the interview. A handful were unable to understand how it would work for the business as they were not involved in business decisions.

7 Barriers to using smart charging

This section outlines the barriers operators and drivers consulted reported to using smart charging. The main barriers fell into the capability category of the COM-B model. Some also were related to motivation. There were fewer barriers in the opportunity category.

The first part of this section outline barriers to smart charging in general, with reactions to specific smart charging approaches outlined later.

Capability to adopt smart charging

There was poor awareness of smart charging in general and what that meant

This was especially evident among drivers. Only 11 out of 44 drivers could explain roughly what smart charging was. Many drivers gave educated guesses but ultimately did not know what it meant. Such guesses included the idea that the vehicle would charge more quickly at lower rates, and kinetic charging when the vehicles' brakes are applied.

> *"I'd imagine it just switches off after it's charged or charges at a lower rate maybe." D22*

> *"Would imagine smart charging is possibly something that charges a lot faster or something that can do wireless charging." D27*

> *"I thought it was where you sell your electricity back but maybe I'm wrong, or is it the kinetic charging when you brake and that sort of thing?" D35*

Once explained, more drivers knew what the concept was but said they didn't know it by the term 'smart charging'.

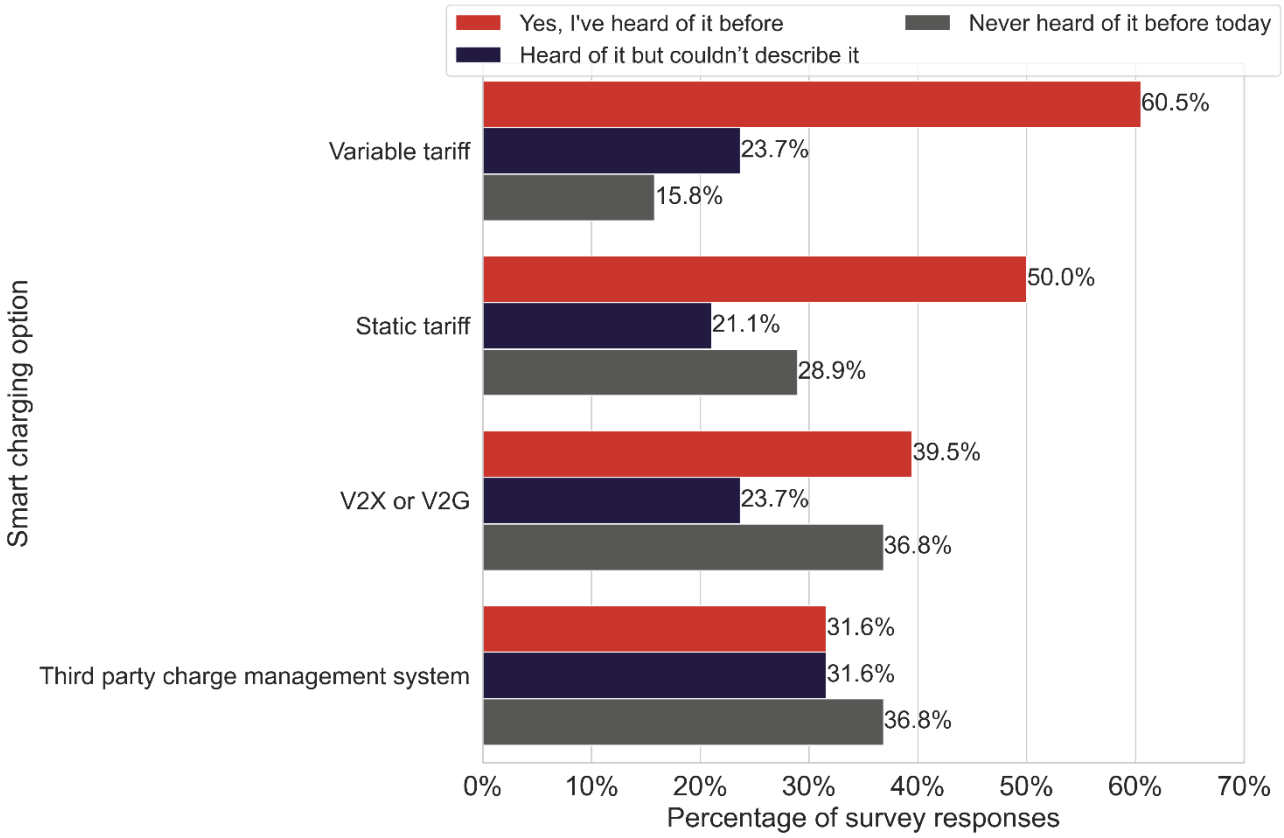
> *"I think I've heard of this, but I didn't know it was called smart charging" D40*

Operators had better awareness of smart charging than drivers but still had some knowledge gaps. Half of operators could explain what it was, with a few being very knowledgeable about the concept: these tended to be those who operated large fleets (400+) which included electric vehicles.

> *"I'm aware of the concept as I use it for my personal EV but not for the business." O29*

> *"…Aware of these. We have explored the options for their operations" O21*

Figure 21: Awareness of smart charging among operators who answered the survey (N=38)



Survey data from operators suggests that they had some awareness of smart-charging approaches in general, but with lower awareness of V2X and third-party charge management system (

Figure 21). Even so, participants often confused the different types of smart charging even after explanation, suggesting that while awareness might have been present, knowledge was less than concrete.

Motivation to adopt smart charging

Operators were generally concentrating on adopting electric vans – smart charging felt like something for the future

Most operators were focusing on trying to adopt electric vans in the first place. Given the variety of barriers they were experiencing in electric van adoption, smart charging was a detail that was far from their minds.

> *"EV technology is quite new to [the organisation]" D6*

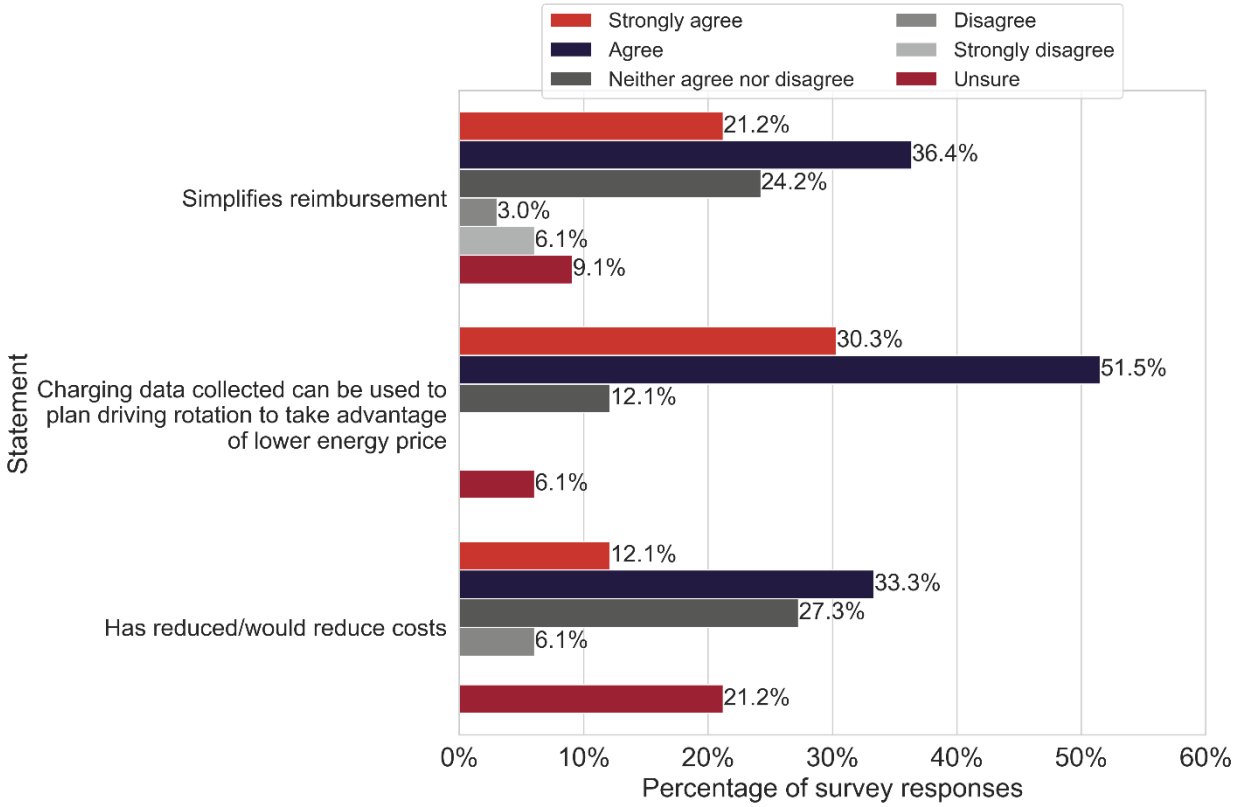
> *"Started electrifying fleet about 2 years ago. There is still quite a lot of things to figure out at the moment. The current focus if to electrify all the fleet that can do the operations on an EV vehicle range" O41*

A couple were starting to consider smart-charging options now that their electric vans were in place:

> *"We've got through the stage, OK, it's all working. The vehicles are fine. The guys love the vehicles, we can charge, and we can get the range. Now we can start saying actually … If you bring it back at 5:00 o'clock, that's fine. You plug it in, but actually it's not gonna start charging until 11:00 o'clock at night, and it'll still be fine…'" O28*

Some felt the benefits were insufficiently certain to motivate them to adopt

Figure 22: Knowledge of key benefits of smart charging technology (N=33)



Operators taking part in the survey were asked to indicate the extent to which they agreed or disagreed with three statements relating to the benefits of using smart charging technology. Figure 22 shows that the majority of the operators surveyed mostly agreed ('strongly agree' or 'agree'; 57.6%) that smart charging would simplify the process of reimbursing their drivers who did not charge at the depot, that it could help with decision making about charging rotations by collecting relevant data, and that it does/would reduce the fleet's operating costs. There were quite a few responses stating they were 'unsure' that using smart charging technology does/would reduce operational costs.

This was supported by responses to a survey question asking operators who were not currently using smart charging to what extent they agreed with statements including *'It is unclear how transitioning to smart charging would impact our costs'* and *'The process of installing and setting up smart charging points at the depot would be too complex and time consuming'* as set out in Figure 23 below.

Figure 23: Concerns around adopting smart charging (N=18)

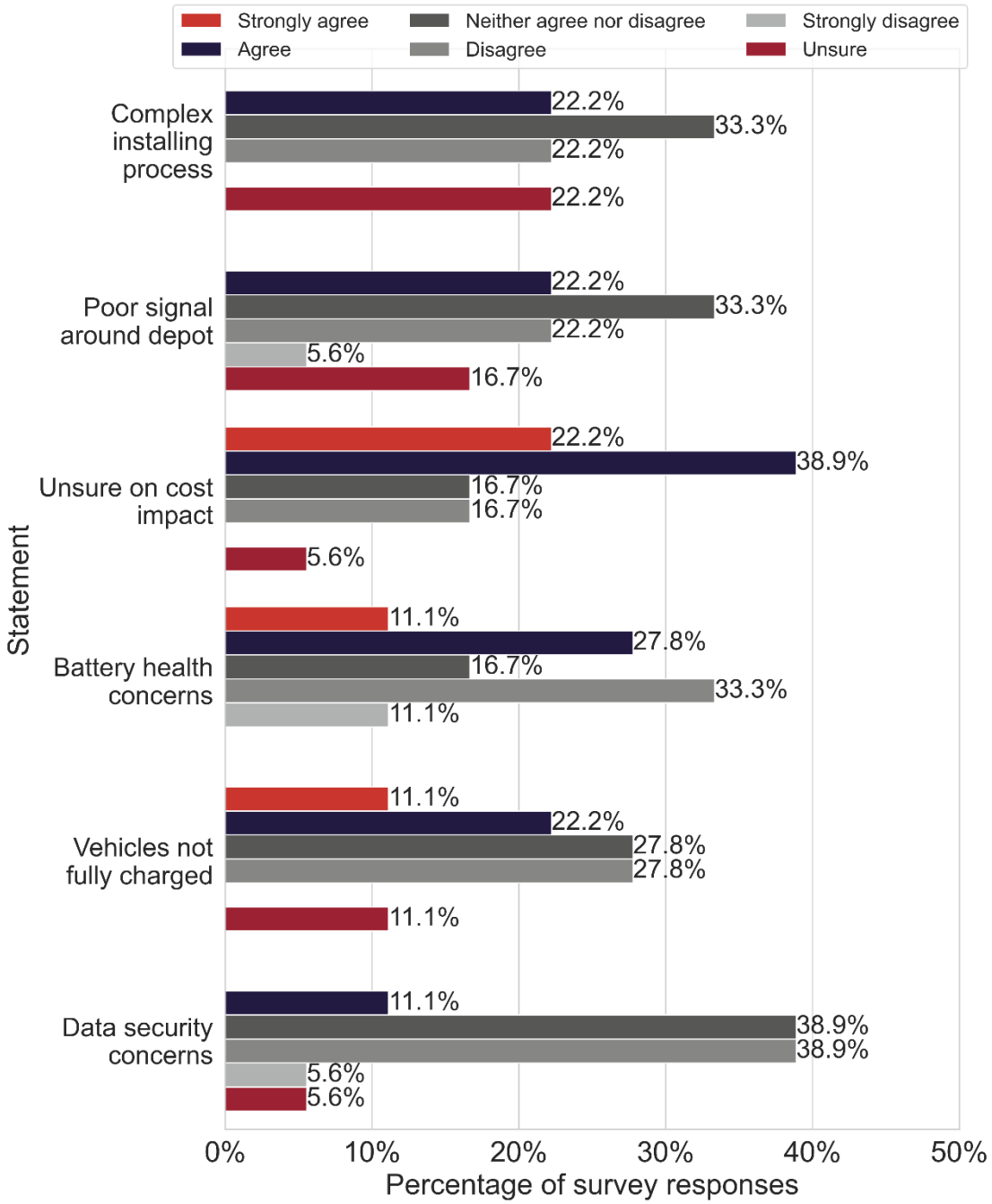


Figure 23 shows that 11 out of 18 operators surveyed (61.1%) agreed or strongly agreed that they were unsure how transitioning to smart charging would impact their costs. Responses to other statements were mixed. There was an even split in respondents who thought that the installation process would be complex. Similarly, there was an almost equal divide in those who had concerns surrounding poor signal and vehicles not being charged, with one less respondent having concerns than the number who did in both cases. There were similar results for battery health, but data security was less of a concern, with more participants disagreeing (38.9%) than agreeing (11.1%) that they were concerned about the impact of privacy of their data. It should be noted that for four of the statements (all but cost impact and battery health),

at least eight respondents were either unsure or neither agreed nor disagreed with the statements.

Interviews with operators revealed that while several businesses could recognise the benefits in theory, there was uncertainty about the benefits that smart charging would bring for their business specifically. This may undermine their motivation to adopt smart charging approaches.

> *If [we] had more EVs, could see that it would make a difference in terms of cost savings…[but] Not enough EVs to make it worth it." O27*

> *"This might work for a fleet of 200 vans where there is someone dedicated to managing charging." O4*

Overall, people could see benefits in theory, but fewer in practice.

Opportunity to adopt smart charging

Few barriers reported fell into the 'opportunity' category.

A minority of operators expressed that smart charging technology might be too expensive to either install or upgrade from earlier generations of chargers already in place – but this was generally not based on concrete knowledge.

One operator based in Scotland, with operations in the Highlands area particularly, noted that the area has poor reception/internet connectivity meaning they did not feel that smart charging could be used reliably in certain areas.

> *"…Also, certain locations like in the Highlands and what not, Wi-Fi connectivity and 4G and other things aren't always there. So, you know could that work in certain, will that work everywhere?" O2*

8 Attitudes towards different smart charging approaches

This section outlines participants' reactions to several smart charging approaches presented to them. The definitions presented to participants (outlined below) were shorter than those used in the survey to make for a more time-effective interview.

Static time of use tariff: These tariffs charge a different price for electricity depending on the time of day, day of the week, or season. These prices are fixed, and users can find out in advance what prices will be charged at certain times.

Dynamic time of use tariff: Similar to static time-of-use tariffs, prices for electricity depend on the time of day, day of the week, or season. However, dynamic tariffs do not have fixed prices, meaning that electricity is not always the same price at the same time of day.

Third party charge management schemes: These schemes allow a third party such as an energy supplier to control the timing and speed of EV charging in order to avoid times when the demand for electricity is high. This control can be overridden.

Vehicle-to-everything (V2X): With V2X services, users can return energy stored in their EV batteries to things such as the national grid, a home, or a building when electricity is in high demand. This can either save or earn consumers money.

Mandatory managed charging: This allows third parties such as energy suppliers to slow down or pause EV charging in last resort situations to avoid localised blackouts. In these situations, EV drivers would not be able to override these actions.

Time of use tariffs

Participants recognised cost savings but had questions over practicality

Unsurprisingly, operators and drivers alike stated that charging at cheaper times would be appealing for their businesses. However, many saw the way these tariffs worked as a disadvantage to those who are unable to charge during these cheaper times. This was due to the schedule of shifts or being on call and requiring the vehicles to be ready to drive at all times.

> *"If you look at the price of electricity in the day as it ebbs and flows over every half an hour, the price you're paying at peak times can be vastly more than it can be at low times." O22*

> *"It wouldn't work for some people… and you're gonna feel like you're being disadvantaged because it doesn't fit to your schedule. It would work for like your Sunday drivers because they could charge up on a Wednesday if it's cheapest then." D24*

"it's good that you know exactly what you're going to be charged, when… but you'd have to time everything to get the cheap prices" D8

Static tariffs were still vastly the preferred option to variable tariffs, because of the greater certainty surrounding prices, making budgeting much easier to do.

[Speaking about variable tariffs] "It's a lot harder to budget, especially for a company of the fleet size I work with" D17

"As an individual that's workable as a company, absolutely not." O4

Another question mark raised surrounded the efficacy of the approach. Many suggested the potential problem of everyone charging at cheaper times, which could create a second, equally expensive peak. In essence, the incentive of cheaper charging times would become redundant soon after it was implemented. This was a concern identified in previous research (Sharp, Delmonte and Jenkins, 2019).

"If everyone was on a lower tariff at night, you'd have a problem. It depends what area you're in." (D40)

Another concern surrounding day to day operations which both drivers and operators shared was whether it could be assured that the vans would be charged when they needed them to be. There was an implicit hesitation that the technology would work as it was supposed to. This concern demonstrates loss aversion: businesses preferring to forfeit any potential cost savings rather than take the risk of losing the ability to use their vans the next day.

"The problem is for a business is you are charging when you need it so you're not plugging in a vehicle and going - It's alright. You can charge that whenever you feel like it. It's plugged in because I need it charging" O16

This general feeling was also identified in previous research, which found that most businesses – irrespective of size – didn't consider time of use tariffs to be suitable for them because they would rather have their vehicles charged and ready to use whenever they need them. The cost of charging at peak times was less of a concern in this earlier research because cost savings had already been realised during the transition from diesel to electric (Sharp, Delmonte and Jenkins, 2019). This difference is likely to be explained by the recent surge in energy prices, which has made electricity much more expensive.

There was a lack of knowledge of software that could help automate charging management

There was a perception that it would take a lot of management to take advantage of lower prices, especially in the case of variable tariffs. This was similar to a finding in previous research that shifting EV charging to when electricity is cheaper could be onerous (Sharp, Delmonte and Jenkins, 2019).

"We would need to work out when the cheap times were and put a system in place to take advantage of it" O1

When participants realised that there was functionality built into the smart chargers themselves and systems/apps that could help, time of use tariffs became more appealing.

> *"If I just could say to a system that the van needs to be charged by [x time] and then the system can decide how it charges it – then yes… And if it's fixed and you know it's going to be that price no matter what, then yeah, you can plan your day around going for the cheapest rate, can't you?" O16*

There was also a perception that this would only be worth doing if the fleet was large enough.

> *"We have 30 electric vans. We have been approached by a software company wanting to offer a solution around charging the fleet – great if all 800 vans are EVs, but not worth the investment for only a few." O15*

Another barrier was the concern about how this would work for home charge points.

Third party management systems

Load balancing was recognised as a desirable benefit

Many operators transitioned to EVs for environmental reasons. For these businesses, load balancing was the most recognised desirable benefit of supplier-controlled smart charging approaches. From these businesses, there was a greater care, or recognition of the need, for grid stability.

> *"I think it works a treat. I think it's something that will have to happen everywhere." D40 (also an operator)*

> *"If it's as deemed essential, isn't it inevitable that will happen" O22*

Cost savings, reduced admin burden, and the ability to override the charging were also cited by drivers as benefits of this smart charging approach

The time and effort saved to focus on other aspects of this approach was also identified in previous research (Sharp, Delmonte and Jenkins, 2019).

> *"I think that would benefit a company, especially the one I work for, quite well, because… obviously it takes away the hassle of us having to manage it ourselves" D17*

> *"As long as they were telling the truth, it was cheapest, that's more convenient as you're not having to do anything; they're effectively doing it for you… It's taken out of your hands and you're not worrying about 'did I set it to come on at 1 o'clock this morning'" D27*

Concerns about practicality and security of supplier controlled smart management systems

There was a great deal of uncertainty and apprehension about how supplier controlled smart management systems would work in practice, for a variety of reasons. The most common of these was a lack of trust in the energy suppliers to have their vans charged when they needed them to be. This was also identified in previous research (Sharp, Delmonte and Jenkins, 2019).

> *"There's always challenges with third parties being involved because you're relying on them to have your company's interests in the forefront of their minds; if they're managing multiple companies at once, you could be pushed under the table" D17*

> *"If it can reduce company costs, they'll do that all day long. As long as the vehicles could be guaranteed to be charged." D37*

> *"Sounds ok. But would want to know how it is controlled. Are the rates the same for all the companies or are they prioritising customers based on size…say if [company X] has higher energy use than my fleet so would [they] get a better price?" O2*

Other reasons behind hesitation included concerns around what third parties would have access to and whether there would be security risks involved in handing over control; and the complexity of certain charging operations/rotations. Similar to the rest of the findings about third party charge management approaches, this second point echoes previous research (Sharp, Delmonte and Jenkins, 2019).

> *"I would need to really read the small print on what they have access to and what they can limit" O17*

> *"There's vehicles on charge at all times… so as long as there's communication between [the charging team and the third-party supplier], it would help a lot" D37*

Previous research also found that participants wondered if costs of adopting such an approach would be worth the benefits (Sharp, Delmonte and Jenkins, 2019).

V2X

Perceived benefits depend on the 'notice' needed to use the vans

Similar to findings in previous research (Sharp, Delmonte and Jenkins, 2019), V2X tended to divide opinion. For those who didn't require all their vans all the time, such as weekends, the ability to save/earn money was appealing. One driver from a bigger fleet (200+) expressed the possibility of using excess charge to power machines at the depot.

> *"It's great for us as we can use our bigger electric vehicles to top up the building's solar supply and run it off completely renewable energy" O38*

"If you could earn money from it… I think that's something that should be put forward 100%" D37

"If there's excess energy you haven't used charging the vans, you could put it back into the depot to power the conveyor belts which would save the company money… or like you say you can give it back to the grid… Kind of a win-win with that one I suppose: you can either make money or use it to save money." D17

"The depot's never manned on a Sunday so any of that power could be something you could… sell on" D35

However, those who needed vans on standby/during peak times couldn't see a use for it. Many were worried about being caught short if they needed their vans quickly.

"When would you ever be in a situation where you'd want to do that?... if you needed to use the vehicle you wouldn't be able to" D12

"I'm just trying to think of a situation where you you'd want to drain the battery out of your vehicle… because at some point you are going to have to charge back up again to be able to go out on the road." O28

Some participants expressed distrust in energy suppliers

There were many other views raised about this type of technology. Those who expressed distrust of the energy suppliers when discussing third party charge management also did so here, making it just as undesirable. However, there was a fear that suppliers would not be paying businesses what they should be for the returned electricity, rather than simply a lack of trust to have the vans recharged by a certain time. In other words, the lack of trust implied a more serious accusation than simply a lack of faith in their competence.

"I would never sell energy back to the grid because they never give you the prices that they charge to take it back off you" D40

"The only thing would be how do you manage it all, how to know how much electric we've given back to the depot?... so, I could work out that we're getting paid the right amount" D22

"You could be selling it to the grid for x amount, and then unfortunately when they're charging your van back up it could be at a higher rate than what you sold it for" D27

Others expressed concern about a low benefit to effort ratio: with some thinking that realising even a modest pay-off would require an undesirably high level of management effort.

"I did speak to somebody ages ago and they said it doesn't really work because you've got to have that much electric to make any money that it kind of was a bit of a waste of time" D03

“If you've got vehicles that or you've got a lot of extra vehicles off road, some of the time maybe then you could just drain the battery out if you wanted to and get some money for it. I think it takes quite a lot of management to get real benefits out of that.” O28

There was scepticism about the advancement of the technology itself, with some believing it to be in its infancy

Specifically, the concern was about the battery of an electric van and its potential for battery wear. This was especially the case with smaller fleets, possibly explained by the greater relative cost of replacing them. This echoes existing findings (Sharp, Delmonte and Jenkins, 2019).

“The impact on the life of the battery because you've got power going backwards and forwards so much, then it's like reducing the life of the battery. So, there's that concern.” O21

“In years to come we might have reduced capacity and reduced range” D42

“If you need the vehicle to be ready to go but if you’ve sold some energy away to make money, then it's not fully charged, and you can't make the trip. Loses out on business money which is probably more than how much you'd make from selling the energy. not worth it.” O29

In addition, there were concerns about how this approach would work in practice if drivers used V2X technology at home. Returning electricity back to an employee’s home would be of no benefit to a business, especially if they had just reimbursed them for charging at home.

“[We have] 150 [vans]…When they're parked in people's homes, if they charge it and we pay for that charge and then the charge goes back into the house and they use it to make their toast, and then I charge the car again... I would have to pay for that” O22

Mandatory managed charging

Mandatory managed charging provoked some of the strongest reactions

Most participants felt that mandatory managed charging would not be acceptable at all, while a small minority did recognise that this would be a last-resort option for load balancing. A feeling of powerlessness overcame some, while others expressed the potential for discrimination as it disadvantaged those businesses who have their own charge points over those who charge using the public network. Previous research found similar results: few accepted the need for mandatory managed charging, and most thought it was too severe and could dissuade transitioning to electric vehicles (Sharp, Delmonte and Jenkins, 2019).

“You’re basically curtailing operational efficiency the day after and so if there’s compensation paid because you can’t provide the network, then that’s what you’d be looking for” O17

“You’re like a little puppet to them, is how I felt” D24

“If this type of smart charging was brought in, she would revert back to using diesel vans out of principal.” O4

"When you have something like that, there's always winners and losers, and there's always a group of people that will get their car charged no matter what" O16

“Don’t think it’s a good idea, no charge means can’t go to work. Company would lose out on business/money. Can see it being very problematic” O29

Fleets of various business activities expressed concerns whether they would be classed as an emergency business or vehicle and would thus be exempt from their energy supplies being affected by third parties. Some operators and drivers who deliver perishable goods such as fresh foods and medical supplies felt that they should get priority in such circumstances as their goods will be wasted if not delivered on time. However, other businesses felt that they would be disadvantaged because their operations could be drastically affected if they cannot have enough charge in the vehicles to go out when needed, due to others being prioritised.

“Some people should be able to override overwise food won’t be delivered” O40

“And it's making sure then if we're delivering people's, you know, tablets and medicines that we can actually definitely deliver it, it's sort of some of the stuff we're delivering now is more critical than just someone's, you know, Boohoo or ASOS order where we're still be fined, but you've got to think of how it would affect people or critical manner.” O21

“Ok within reason but not if it’s because energy companies haven’t invested in the system and are prioritising paying their shareholders.” O28

“Can they really restrict it? What about priority industries” O1

9 Conclusions and recommendations

The objectives for this research were to understand:

- The driving and charging patterns of commercial van fleets.
- Enablers and barriers commercial fleet operators and drivers face in adopting electric vans.
- Enablers and barriers commercial van fleet operators and drivers face in installing and using smart charging technologies.

We discuss the main findings for each of these below, along with recommendations where appropriate.

The driving and charging patterns of commercial van fleets

Unsurprisingly, there was a range of driving and charging patterns, reflecting the varying nature and different business operations of van fleets. Key findings are set out below.

Most of the charging was reported to be done overnight (i.e., hours between 2000 and 0700 the following day). Fewer operators reported charging between 0700 and 1600.

During the day, enroute charge points were reported to be the main charging site, followed by the depot. Charging in the daytime was mostly reported as a second option, suggesting that it was not typical to be charging at the selected sites during the day, and would be done so in case of emergencies.

At night, the majority of participants charged their electric vans at the depot or using private or on-street residential chargers.

Similarly, non-electric vans were mainly parked at the depot or the drivers' home/residential parking.

The majority of those with electric vans indicated that it was typical for their electric vans to be plugged in only once a day, rather than multiple times, or every other day.

Enablers and barriers commercial fleet operators and drivers face in adopting electric vans

Overall, operators and drivers who participated in this research seemed supportive of electric vans in theory. Despite this positive outlook, and the fact that some research participants had adopted electric vehicles, several barriers to uptake were found.

Most of these barriers fell within the ‘opportunity’ category of the COM-B behavioural model. This means that many of the barriers are within the external environment, rather than motivational barriers or barriers related to the participants’ knowledge and capability.

Many research participants reported that current models of electric van don’t provide the ability to travel the daily distances required without being re-charged during the working shift. Operators were reluctant to change their operational model to account for this additional charging time. Some research participants were unsure whether the advertised range of vans was accurate for their payloads, and a few reported struggling to access demonstrator vehicles to test this for themselves.

Operators included in this research who had adopted electric vans tended to run businesses which required shorter drive distance per shift and/or where drive distances were more consistent. It appeared that those who drove more varying distances between shifts were less likely to have adopted electric vans. This can be interpreted in terms of distance and variability – operators feel more confident adopting electric vans when they are more certain that the distance driven per shift falls within the range of the vehicle.

It was notable that operators included in this research who had adopted electric vans tended to have done so for only part of their fleet. This seemed to be because they had different types of operations within the business, and electric vans were deemed suitable for those driving the shorter and/or less variable routes – but not for other routes.

As well as the perception that the range of vehicles was not always reported to be suitable for business needs, research participants felt that there isn’t currently a cost-effective and feasible way to charge electric vehicles. Many don’t use a back-to-depot model which means that they would be reliant on public charging. Some felt that public charging is expensive and would negate any cost savings achieved by the overall lower cost of electricity compared to petrol or diesel. Other challenges included a perception that charge points for business vehicles are hard to find, may not be in working order, may not be suitable for large vans and may require waiting for long periods of time. All of these issues would directly impact their ability to operate effectively and deliver the service they desired.

These challenges with public charging meant that many are waiting on improved vehicle range before adopting.

Even with larger ranges, home-charging and depot-charging posed some challenges. Home-charging was not always possible or practical for the operators and drivers included in this research. Many drivers reported that installing a charge point at their home would not be feasible, and operators were worried about some of the practicalities around ownership of and responsibility for charge points, along with reimbursement processes.

Those who did operate a back-to-depot model faced fewer challenges in this area. However, the cost of installing charging infrastructure at depots was still reported to be a barrier. Despite some awareness of the Workplace Charging Scheme and EV Infrastructure grants, operators cited the cost of large upgrades to site power supplies to be a barrier. They reported that they struggled to quantify and justify the large upfront expenditure.

Aside from these barriers related to ‘opportunity’ (the external environment), there was one barrier that fell within ‘capability’. Some reported that adopting electric vans felt complex and daunting – many indicated that they were unsure where to begin and who to trust for advice. Some felt that they were having to navigate this new area alone, with little joined-up approach between business and within regions.

Operators included in this research were open to exploring shared private charging sites to share the cost and burden with others.

Recommendations

There are several opportunities to overcome these barriers, which should be considered by industry, Government and Local Authorities. These have been clustered under capability, motivation and opportunity, in line with their associated barriers.

Recommendations to overcome capability barriers

Overview of barrier	Recommendations
Some operators included in this research weren’t sure where to start with upgrading depot charging infrastructure, or who to go to for advice.	• Help guide operators and fill knowledge gaps (e.g., around infrastructure upgrades / home-charging approach). Make use of existing communications touchpoints such as vehicle manufacturers, industry magazines, networking events and commercial vehicle shows. • Create a knowledge-sharing community – potentially facilitated by trade associations – to encourage operators who have upgraded infrastructure to share their experiences and learnings.
It wasn’t clear if some operators included in this research were aware of government grants to assist with installation of charge points	• Raise awareness of the Workplace Charging Scheme and EV infrastructure grant. This could include working with third parties such as vehicle manufacturers and energy providers to spread awareness, as these were cited as common sources of information for operators.
Some operators included in this research felt like they didn’t have the appropriate accurate data about the range of electric vans.	• Encourage fleets who are using electric vans to share data about vehicle performance with other operators to help guide decisions. Trade associations could play a key role in this regard.

Recommendations to overcome motivational barriers

Overview of barrier	Recommendations
Whilst most research participants were supportive of the concept of electric vans, and were aware of associated targets, a few were not.	• Trade associations and fleet operators to continue to highlight the benefits of electric vans. • Continue to highlight the 2027 target for central government organisations to have zero emission fleets and 2035[3] target for phase out of the sale of new ICE vans.

Recommendations to overcome opportunity barriers

Overview of barrier	Recommendations
Some operators included in this research felt that current electric van ranges wouldn't allow them to operate as they currently do with ICE (mostly diesel) vehicles. Some felt unsure about how the vehicle range would be affected by their payloads.	• Support vehicle manufacturers to improve vehicle range technology, for example by continuing the Faraday Battery Challenge funding and introducing the Zero Emission Vehicle mandate to stimulate investment. • Original equipment manufacturers and trade associations should work together to make demonstrator vehicles more readily available across business (customer) sizes. • Explore the merits of an updated Worldwide Harmonised Light Vehicle Test Procedure for commercial vehicles to improve the validity of range data. Original equipment manufacturers could benefit from market advantages by carrying out testing with different payloads and releasing the resulting data to operators.
Some operators and drivers included in this research reported that charge points for business vehicles are hard to find, may not be in working order, may not be suitable for large vans and may require waiting for long periods of time.	• Ensure the public charging network includes facilities with parking that is suitable for larger electric vans. • Continue to mandate the use of shared, real-time charge point data to provide functional charge point availability updates and encourage charge point operators to go further by sharing wait times and space size. • Consider reserving some public charge points for commercial vehicles only (no private vehicles) as is

[3] Following the general election in the United Kingdom in July 2024, the commitment to phase out the sale of new cars that rely solely on internal combustion engines has been amended to 2030.

	the case with kerbside bays which are reserved for commercial vehicles loading/unloading only.
Some operators included in this research reported that installing charging infrastructure at depots would not be feasible or cost-effective.	• Commission work to validate potential business models around shared private charging facilities, which could inform the development of a blueprint for this type of facility. • Facilitate networks of businesses who can work together to create shared charging facilities. This could include regional/area coordinators who work with businesses in the area to understand requirements, and to set out a regional charging strategy/ proposal. • Consider expanding existing grants[4] or creating new ones to cover the upgrading of power supply to business sites (e.g., new substations).
Some operators included in this research reported long wait times when communicating with Distribution Network Operators (DNOs) and organising site surveys.	• Work with key stakeholders across the industry, including National Grid, DNOs, National Highways, and Local Authorities to understand the barriers and solutions for accelerating the roll out of depot charging infrastructure.[5]
Some operators and drivers included in this research reported that reimbursing home-charging was complex.	• Support the private sector to develop or improve their systems for reimbursement for home charging – notably to allow operators to differentiate whether it is a work vehicle that is being charged, and to pay energy suppliers for electricity use directly rather than having to reimburse drivers.
Some operators included in this research found driver training and MOT requirements around 4.25 tonne vehicles a financial and logistical burden.	• Proceed with the removal of the additional driver training requirements (resulting from a recently published consultation response) for 4.25-tonne vehicles and continue to consult about amending the MOT requirement for large electric vans.

[4] The existing Electric Vehicle Infrastructure grant provides support for installing infrastructure required to install a charger. It can support up to £500 per bay, as well as £350 for a charger.
[5] As announced in the Plan for Drivers (2023), the Department for Energy Security and Net Zero and the Office for Zero Emission Vehicles are launching a review of the grid connections process for installing chargers.

Enablers and barriers commercial van fleet operators and drivers face in installing and using smart charging technologies

Sixteen operators surveyed, five operators interviewed, and four drivers interviewed reported that they were using smart charging approaches. These figures need to be interpreted with caution as the interviews revealed that many did not understand what smart-charging is and some could not confidently state which type of smart charging was being used at their organisation.

When looking at factors such as business activity type, region of main base, fleet size, typical distance travelled from base, and typical weekly mileage, we did not identify any specific characteristics which influenced whether an organisation was using smart charging or not.

The main barriers to adopting smart charging fell within the ‘capability’ and ‘motivation’ category of the COM-B behavioural model. This means that key challenges related to the participants’ knowledge, capability and willingness to use the technology.

Overall, there was poor awareness and understanding of smart charging. Whilst many operators, and some drivers, in the sample had heard of the concept of smart charging, many struggled to explain what it was or were unaware of different smart charging approaches.

Once some of the smart charging approaches were explained to participants, some could see the benefits in terms of cost-savings. But, partially because of lack of familiarity around the technology, participants expressed concern that these approaches would require a lot of effort to set up and operate on a day-to-day basis. They felt that this effort and the upfront costs outweighed the potential cost-savings that could be realised. Although some acknowledged that smart charging would help manage demand for electricity across the country, overall, they didn’t feel that they themselves would see many benefits. This was especially true for drivers – as their business often covered the cost of charging, they tended not to see the relevance of the technology for them personally.

These findings show that a key opportunity to promote smart charging lies in raising awareness and understanding of smart charging in the first place, but also in highlighting potential benefits to individual fleets.

Recommendations

There are several opportunities to overcome these barriers. These have been clustered under capability, motivation and opportunity, in line with their associated barriers.

Recommendations to overcome capability barriers

Overview of barrier	Recommendations
Many of the operators and most of the drivers consulted were unaware of the concept of smart charging.	• Raise awareness among businesses of the existence and variety of smart charging approaches, potentially in an integrated fashion with existing information about EV adoption. This could include working with trade associations, energy suppliers and manufacturers to distribute information.

Recommendations to overcome motivational barriers

Overview of barrier	Recommendations
Some operators and drivers included in the research stated that benefits were also perceived as being insufficiently appealing to make the effort to adopt.	• Raise awareness among businesses of the benefits of smart charging approaches, potentially in an integrated fashion with existing information about EV adoption. This could include working with trade associations, energy suppliers and manufacturers to distribute information. • Support for smart-charging stakeholders to provide opportunities to trial smart charging technology where possible to show benefits. • Provide guidance or financial support – especially for smaller fleets – for installing or upgrading to systems such as V2X or additional software to manage tariffs.

References

Chappell J, West A, Skippon S, Wilkinson P, White M and Willis S (2017). *Consumers, Vehicles and Energy Integration: D6.1 Fleet Study*

Department for Transport (2021). *Van Statistics 2019-2020: Technical Report.* Report dated April 2021.

Element Energy for the Climate Change Committee (2022). *Analysis to identify the EV charging requirement for vans: Final Report.* Report dated August 2022.

GOV.UK (2021a). *Electric Vehicle Smart Charging; Government Response to the 2019 Consultation on Electric Vehicle Smart Charging.* Report dated July 2021.

GOV.UK (2021b). *Outcome and response to ending the sale of new petrol, diesel and hybrid cars and vans.* Report dated July 2021.

GOV.UK (2022). *Vehicle licensing statistics data tables.* Available from https://www.gov.uk/government/statistical-data-sets/vehicle-licensing-statistics-data-tables

GOV.UK (2023). *PM recommits UK to Net Zero by 2050 and pledges a "fairer" path to achieving target to ease the financial burden on British families.* Press release, issued 20 September 2023

Logistics UK (2023). *Electric Vehicle Report.* Available from https://logistics.org.uk/research-hub/reports/ev-report

Michie S, van Stralen MM and West R (2011). The behaviour change wheel: a new method for characterising and designing behaviour change interventions. *Implementation science : IS*, *6*(42), doi.org/10.1186/1748-5908-6-42

Sharp R, Delmonte E and Jenkins R (2019). *Smart electric vehicle charging: what do drivers and businesses find acceptable?* (PPR903). TRL, TRL Limited: Crowthorne.

The decision Lab (No date). [online]. [Accessed 26th September 2023]. Available from World Wide Web: https://thedecisionlab.com/reference-guide/organizational-behavior/the-com-b-model-for-behavior-change

Appendix A List of fleet operators and van drivers interviewed and surveyed

Name	Participant type	Fleet size	Archetype number (if EV) or operating type (if non-EV)	Contact type
Construction	Operator 01	2-9	Regional	Interview only
Courier/postal delivery	Operator 02	51-200	8	Interview and survey
Properties maintenance	Operator 03	10 - 50	4	Interview and survey
Other	Operator 04	2-9	6	Interview and survey
Transporting goods	Operator 05	200+	7	Interview and survey
Courier/postal delivery	Operator 07	10 - 50	Local to national	Interview and survey
Transporting goods	Operator 09	200+	8	Interview only
Properties maintenance	Operator 15	200+	5	Interview and survey
Other	Operator 16	51-200	National	Interview and survey
Utilities maintenance	Operator 17	200+	National	Interview and survey
Courier/postal delivery	Operator 21	200+	8	Interview and survey
Other	Operator 22	51-200	Regional	Interview and survey
Security, roadside enforcements	Operator 27	200+	5	Interview and survey

Courier/postal delivery	Operator 28	51-200	6	Interview and survey
Construction	Operator 29	51-200	National	Interview and survey
Properties maintenance	Operator 30	200+	7	Interview only
Utilities maintenance	Operator 35	200+	12	Interview and survey
Security, roadside enforcements	Operator 38	200+	8	Interview and survey
Security, roadside enforcements	Operator 39	200+	National	Interview and survey
Transporting goods	Operator 40	200+	12	Interview only
Utilities maintenance	Operator 41	200+	6	Interview and survey
Transporting goods	Operator 42	10 - 50	National	Interview and survey
Properties maintenance	Operator 43	200+	8	Interview only
Transporting goods	Driver 01	51-200	5	Interview only
Transport infrastructure provider	Driver 03	10 - 50	11	Interview only
Transport infrastructure provider	Driver 04	10 - 50	7	Interview only
Roadside assistance	Driver 05	2-9	Regional	Interview only
Courier/postal delivery	Driver 06	200+	4	Interview only
Transport infrastructure provider	Driver 07	2-9	11	Interview only
Properties maintenance	Driver 08	200+	Regional	Interview only

Properties maintenance	Driver 09	1	Regional	Interview only
Properties maintenance	Driver 10	10 - 50	Regional	Interview only
Properties maintenance	Driver 11	51-200	8	Interview only
Courier/postal delivery	Driver 12	2-9	7	Interview only
Properties maintenance	Driver 14	2-9	5	Interview only
Transporting goods	Driver 15	2-9	Local	Interview only
Courier/postal delivery	Driver 17	200+	National	Interview only
Properties maintenance	Driver 18	200+	7	Interview only
Transporting goods	Driver 19	2-9	6	Interview only
Other	Driver 20	10 - 50	2	Interview only
Construction	Driver 21	10 - 50	10	Interview only
Courier/postal delivery	Driver 22	2-9	4	Interview only
Utilities maintenance	Driver 23	51-200	National	Interview only
Transporting goods	Driver 24	51-200	National	Interview only
Construction	Driver 25	2-9	11	Interview only
Transporting goods	Driver 26	2-9	11	Interview only
Construction	Driver 27	51-200	Local	Interview only
Transporting goods	Driver 28	51-200	3	Interview only
Properties maintenance	Driver 29	2-9	5	Interview only

Construction	Driver 30	2-9	National	Interview only
Utilities maintenance	Driver 31	200+	National	Interview only
Properties maintenance	Driver 32	10 - 50	Regional to National	Interview only
Other	Driver 33	10 - 50	Regional	Interview only
Other	Driver 34	51-200	12	Interview only
Transporting goods	Driver 35	10 - 50	4	Interview only
Transporting goods	Driver 36	200+	11	Interview only
Courier/postal delivery	Driver 37	10 - 50	11	Interview only
Courier/postal delivery	Driver 38	200+	12	Interview only
Transporting goods	Driver 39	10 - 50	11	Interview only
Properties Maintenance	Driver 40	2-9	7	Interview only
Security, roadside enforcement	Driver 41	51-200	3	Interview only
Properties maintenance	Driver 42	51-200	4	Interview only
Courier/postal delivery	Driver 43	200+	11	Interview only
Courier/postal delivery	Driver 44	200+	3	Interview only
Transporting goods	Driver 45	2-9	3	Interview only
Utilities maintenance	Driver 46	200+	11	Interview only
Transporting goods	Driver 48	10 - 50	4	Interview only

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